RAILROAD GAZETTE

FRIDAY, FEBRUARY 17, 1899

CONTENTS.

ILLUSTRATIONS:	PAGE
80,000 Lbs. Capacity Cars for the Cleveland, Cincinnati, Chicago & St. Louis	119
Tests of Locomotive Boiler Coverings	119
Journal Burnisher Used by the Missouri Pacific	121
Tonnage Rating for Locomotives	122
Fall of a Highway Bridge.	123
CONTRIBUTIONS:	
The Junior Mechanical Engineers	117
Broad Flanges vs. Tie Plates	117
The Designing of Draw-Spans	117
EDITORIALS:	
A New Train Resistance Formula	124
Scientific Foresty in New York	125
EDITORIAL NOTES	124, 125, 126
GENERAL NEWS:	
Locomotive Building	129
Car Building	129
Bridge Building	129
Meetings and Announcements	130

GENERAL NEWS:	PAGE
Personal	130
Elections and Appointments	131
Railroad Construction	131
Electric Railroad Construction	132
General Railroad News	134
Electric Railroad News	131
Traffic	134
MISCELLANEOUS:	
Technical	126
The Scrap Heap	127
The Per Diem Basis for Interchange Car Service	117
Quick Work with a Wrecking Train	118
Masonry or Wooden Dry Docks	120
Ten-Wheel Freight Locomotives for the Southern Indiana	121
Present Status of the Maintenance of Way Association	121
Deviations in the Results of Cement-Testing	122
Wages and Hours of Grand Trunk Telegraph Operators	123
Modern Rolling Stock	123
The Snowstorm	126
Combustion and Calorimeters	126
Disinfecting Stock Cars	127
The Boston Subway	127

Contributions.

The Junior Mechanical Engineers.

Feb. 10, 1899.

To the Editor of the Railroad Gazette:

Thanks for the "Junior Engineer" article, and still greater thanks for the evidence of the comprehension and appreciation of the importance of the subject. [See Railroad Gazette, p. 101.] Any movement that aids to securing an added ten or fifteen years to the useful life of the American engineering fraternity may result in untold advantage to the advancement of civilization, more particularly to American civilization, because Americans are more ready to see and willing to utilize the possible forces to this end. In many respects American engineers, particularly in mechanical engineering, are in the front rank to-day, but it will require our best efforts to maintain our present relative position and to catch up wherein we are behind. Our form of government and environment have placed us where we are. These advantages are growing relatively less year by year. The necessity is upon us to look ahead and to be ever alert to discover and utilize new advantages sooner than our conservative competitors will or can do. This Junior Engineer movement, it is hoped, will prove a step in this direction.

S. W. B.

Broad Flanges vs. Tie Plates.

To the Editor of the Railroad Gazette:

I have taken pleasure in reading your editorial on "Broad Flanges vs. Tie Plates." Your arguments against the use of the wide rail base instead of tie plates seem to cover the ground and emphasize the lack of sense in wasting a lot of metal in the rail base, a large proportion of which does not come in contact with the ties.

There is also the fact that a wide rail base will not keep the gauge from spreading on curves, nor on tangents where soft-wood ties are used, whereas tie plates accomplish that end in addition to preserving the fibre of the ties from injury.

However, the most powerful argument against Mr. Sanberg's position is the lateral and longitudinal movement of the wide rail base under traffic, which would grind and abrade the surface of the tie to practically the same extent as the narrower rail base, whereas the tie plate is imbedded in and becomes a part of the tie, secure from movement, and the fibre of the tie is not injured. It is this feature of the tie plate, securely attached to the tie and holding the spikes firmly against the rail, that is more valuable than the increased bearing surface. This is prover by the fact that even where tie plates have been used that project very slightly beyond the edges of the rail base, and therefore do not materially increase the bearing surface, the life of the tie is materially increased.

This company is using this year about 300,000 cedar ties with tie plates, and expects to derive therefrom about twelve or fifteen years of life, whereas with the rail such as Mr. Sandberg describes, we could not expect more than five or six years of life.

ENGINEER MAINT. OF WAY.

To the Editor of the Railroad Gazette:

I am convinced that your criticisms of Mr. Sanberg's article are good, and will coincide with the views held by American track officials.

Mr. Sanberg, probably unwittingly, conveys the idea that ties fail on account of cutting. As a matter of fact, the ties in the average railroad track fail through decay. The point you make relative to 75 per cent. of the rail base not bearing on the ties is strong.

It has been clearly demonstrated that the cutting of ties is due to the sawing action of the rail and increased width of flange, while reducing, does not eliminate this action. Our experience teaches us that unprotected ties cut more rapidly under 4-in. rail base than under 5-in. base, the traffic conditions being the same. We know, also, that ties protected by tie plates, cut much less rapidly under 4-in. base than unprotected ties under 5-in. rail base. This fact, alone, should convince any champion of the wide base of the error of his ways.

GENERAL ROAD MASTER.

The Designing of Draw-Spans.*

Wilmington, Del., Jan. 23, 1899.

To the Editor of the Railroad Gazette:

In your issue of the 20th you imply that I have used a formula for rollers, in which the strength varied as the diameter, for a lattice span and that for a plate girder, I have used one in which the strength varied as the square root of the diameter. If your reviewer will point out one single case in which I have done so, I will pay him liberally for his time and trouble. He cannot do it. I will state for his benefit what is well known to any one familiar with American bridge specifications:

There are in common use at present two formulæ for the strength of expansion rollers. In one of these the strength varies as the diameter, and in the other it varies as the square root of the diameter. In my discussion of rollers where used under conditions similar to the above, I have used the formula which considers the square root. On page 261, among other formulæ, I give the one for rollers, in which the strength varies as the diameter.

Your reviewer should keep in mind that soft or medium steel rollers, bearing on plates of the same material, are one thing; hardened steel rollers and specially prepared bearing surfaces are another, and small rings of rollers, as used in a heavy shaft bearing, are still another.

You kindly offer me space for the demonstration of the "mysterious" shafting formula. I hope your readers will note this point. You are generous indeed to allow me to use space in demonstrating what is discussed and used, on page 215 of Unwin's "Machine Design"; on page 891 of Lanza's "Applied Mechanics"; on page 245 of Bovey's work on strength of materials; on pages 15 and 94 of "The Constructor" (Reuleaux); and in other books on machine design. If your reviewer prefers the German language he will find a full discussion of the formula in the German edition of Prof. Reuleaux's work. If the formula is "incorrect and absurd," it is, at least, in very good company.

CHAS. H. WRIGHT.

[When a round shaft is subject to bending only, its diameter is to be found from the well-known formula

$$d^3 = 10.2\ M/S \quad \ldots\ldots (1)$$

in which M is the bending moment and S the allowable tensile unit strain. When it is subject to twisting only, its diameter is to be found from another well-known formula

$$d^3 = 5.1\ T/s \quad \ldots\ldots (2)$$

in which T is the twisting moment and s is the allowable shearing unit strain. But if both bending and twisting occur simultaneously, then the combined maximum M and T are to be found, and d be computed from both (1) and (2) and the largest value be selected. The correct formulae for M and T, as derived by Bovey, Lanza and others, are,

$$2\,M = m + \sqrt{m^2 + t^2}. \quad \ldots\ldots (3)$$

$$T = \sqrt{m^2 + t^2} \quad \ldots\ldots (4)$$

in which m is the given bending moment and t the given twisting moment. These formulae are not well-known, and they are often misunderstood and misapplied.

Unwin in his Machine Design and Wright in his Designing of Draw Spans use only formul (2) and (3) for the discussion of shafts. They say, however, that the quantity which is computed by the second member of (3) is the "new twisting moment" and that this is to be used in (2) to find the diameter. That this interpretation is incorrect may be seen by taking a shaft which is not under torsion; then $t = 0$ and (3) gives 2 m as the "new twisting moment," and accordingly the diameter is computed from (2) without reference to the tensile strength of the material.

To give a concrete illustration, let a shaft be under a bending moment of 80,000 inch-pounds and also under a twisting moment of 60,000 inch-pounds, and let the working strains for the steel be 10,000 pounds per square inch in tension and 7,000 in shearing. By (3) the actual bending moment M is 90,000 inch-pounds, and then from (1) the required diameter is $d = 4.65$ inches. Also by (4) the actual twisting moment T is 100,000 inch-pounds, and then from (4) the required diameter is $d = 4.18$ inches. In this case it is seen that the tensile strength, and not the shearing strength, controls the size of the shaft. By the method of Unwin and Wright there is found for the new twisting moment T the incorrect value of 180,000 pounds, and this inserted in (2) gives for the diameter $d = 5.08$ inches. It thus appears that this method, although defective in theory, has the merit of erring on the side of safety.—Editor Railroad Gazette.]

* See the Railroad Gazette, pp. 11 and 37.

The Per Diem Basis for Interchange Car Service.*

Mr. Daly opens his paper with an interesting account of a lawsuit between two Chicago trucking firms, concerning the compensation for the wagons of one, used by the other; and from the details of this wagon business he draws apt illustrations of the evils of the mileage plan of settling for freight cars interchanged between one railroad and another. Going on to discuss car service, he says:

In considering car hire settlements, either on a per diem or mileage basis, the earnings of the cars while away from home is all that can be properly considered. I note that many officials, when compiling data on this subject, use as a basis the average mileage performed both at home and away, which misleads them into thinking their cars are being moved reasonably prompt while on foreign roads. Illinois Central cars average about 39 miles per day at home, and about 14 miles per day away from home. It is this latter condition we aim to improve with per diem. The mileage plan carries with it no incentive or inducement to hurry to owners their equipment. In fact it has a tendency to prevent the prompt homeward empty movement, as the road moving car empty must pay the same rate, viz., six mills per mile, as if car was under load. Hence the desire to hold for loading frequently an unreasonable time.

On the other hand, per diem carries with it a penalty against delay that will overcome these irregularities and bring to the owner of cars the desired results. As there are two per diem propositions, it will be well to explain both. First, straight per diem or a set amount per day—15 cents having been recommended, this 15 cents per day to be paid to the owner of the car by the road in whose possession car may have been; under the present system of exchange notice the owner is enabled to keep an accurate check of the number of days its cars are on the tracks of foreign roads, and there could be no chance to manipulate their earnings by false returns. The objections brought against straight per diem are from roads that have not enough cars to take care of their traffic, or from roads that permit their consignees to use other companies' cars as warehouses. Again the borrowing road wants a low rate and the loaning road wants a high rate, and it has been impossible to reconcile both parties to agree on a rate, although the matter has been discussed and recommended by railway associations for the past 15 years.

The other proposition is an exchange per diem and mileage plan. This plan combines the per diem with the mileage as follows:

Allowing that the freight equipment of this country will equalize as to value, my proposition is to exchange one car day for another; then, if there is a balance number of days due, settle for them on the mileage basis at the rate all of the cars of the creditor road earned on the tracks of the debtor road during the month in question.†

In order to practically demonstrate the value of this exchange per diem plan, the following roads began using it July 1, 1898: A., T. & S. F., B., C. R. & N., C., H. V. & T., C., M. & St. P., Illinois Central, M., K. & T., and Southern Pacific. I think it will be admitted that the roads named are so geographically located as to afford foreign cars a much better movement than the average road.

The result for July, August and September, 1898, as compared with the same months of 1897, shows as follows:

Month.	Car days.	Car miles.	Average miles.
July, 1898	20,819	585,998	28.63
July, 1897	23,720	446,595	18.82
Increase	....	139,403	9.81
Decrease	2,901	....	....
August, 1898	28,616	788,490	27.55
August, 1897	29,110	583,447	20.04
Increase	....	205,043	7.51
Decrease	494	....	....
September, 1898	37,341	1,065,673	28.54
September, 1897	38,562	964,681	25.02
Increase	....	100,992	3.52
Decrease	1,221	....	....

*From a paper read before the New York Railroad Club February 16, 1899, by J. M. Daly, Superintendent of Transportation of the Illinois Central.

†Mr. Daly's plan was described in the Railroad Gazette last year, pages 437, 474 and 607.

Total for the three months:

Month.	Car days.	Car miles.	Average miles.
1898	86,776	2,440,161	28.12
1897	91,392	1,994,723	21.82
Increase	....	445,438	6.30
Decrease	4,616	....	....

Showing that for three months, two busy and one light, we increased the average mileage 6.3 miles per car per day. Even the above roads, that have direct track connections and are favorably situated so as to enable them to obtain a good average movement, prior to adopting the exchange per diem plan, reported but 21 miles per day. That being the case, does it not stand to reason that smaller roads less fortunately located make smaller returns, thereby substantiating the claim of 15 miles as the average on all roads and belt lines?

This 6.3 miles increase may appear small to some who have not gone into the matter, but as the Illinois Central has about 10,000 of its cars away from home each day, this increase would amount to 23,110,000 miles per annum; at 6 mills per mile, $158,660 increased receipts., or allow 17 miles per day to be the average performance at present, that would be 6,205 miles per annum; that divided into 23,110,000 miles, the net increased movement, it would therefore require 3,740 less cars to perform the same service. And when you consider that railroads pay to each other over $20,000,000 per annum for car hire, exclusive of the amount paid to owners of private cars, you will realize how enormous is the expense.

Twenty million dollars represent the mileage earnings of 547,945 cars away from home for an entire year, allowing they averaged 17 miles per car per day, which is even more than they actually earn. Now by adopting the exchange per diem plan, we are able to increase this average 6.3 miles per car per day —from 17 to 23.3—which is still five miles per day less than per diem roads now perform.

Six and one-third miles per day is equal to 2,311 miles per annum; 2,311 times 547,945 equal 1,266,300,895 increased miles per annum. Now, for the sake of argument, let us take but one-half of that saving as a safe basis to work on, viz., 633,150,447 miles; an average of 17 miles per day is equal to 6,205 miles per annum; this divided into 633,150,447 shows 102,038 less cars necessary under the exchange per diem than under the present mileage plan to perform the same service. This result, after conceding one-half the increased movement obtained, is certainly a liberal and safe estimate to base future results on.

In obtaining this result on the member roads it has not been necessary to increase the empty car haul expense nor has it in any way interfered with the free interchange of cars; in fact, the figures show more mileage performed under the per diem than mileage plan, so that we exchange cars more freely now than we did when operating under the mileage plan.

When member roads order cars we know they have immediate loading for them and are not ordering them to store for prospective loading.

The C., M. & St. P. and Illinois Central interchange equipment quite extensively and when the exchange plan was adopted Mr. Beecham and myself visited personally several of our largest interchange points, called our superintendents and agents together, explained our plan and arranged for the handling of cars to the mutual interest of both companies.

We found at most points the main cause of delay was occasioned by switching service, our agents working on the basis that the road delivering a switch car was responsible for getting consignee to unload, instead of the road doing the switching, and invariably the agent of the delivering road failed to take any interest in it after the delivery was made. We immediately changed this system and instructed the agent of the road in possession of the car to arrange for its prompt release. This resulted in our making the following arrangements: If Mr. John Smith, a coal dealer, located on our tracks, secures his coal from points on the C., M. & St. P., we will accept and store on his delivery track 48 hours' supply of cars, and if he does not unload promptly, we shut off receiving any further cars, until he resumes unloading. This forces the C., M. & St. P. to hold the cars in its own yard, and not only saves us the per diem expense, but affords us the use of valuable terminals for our own traffic. Then in case Mr. Smith continues to order and receive coal, the C., M. & St. P. agent places a restricting order at the mines against the supply of cars for his business until the cars then loaded have been released. This prevents accumulation and gives the railroad the use of its cars in handling traffic for other consignees that will release them promptly.

Prior to this arrangement Mr. Smith could go on the market and buy a large tonnage at favorable prices, ship it, for instance, to Dubuque, knowing that he would be obliged to hold on cars until he could effect sales at country points, and if the agent of the C., M. & St. P. objected to the delay to cars, he would order them switched to the Illinois Central. The coal being loaded in C., M. & St. P. cars, we lost nothing but the use of the track cars stood on, and our agent made no complaint, using it as an inducement to affect outbound traffic.

Frequently special delivery tracks assigned to individual consignees are utilized almost exclusively in taking care of traffic coming from connecting lines and in a great many instances I am satisfied the road owning the track would not release it to the delivering road for a sum equal to its entire switching receipts from traffic handled on such track, even though the lessee agreed to move and place cars on delivery with its own power and men, thereby saving the owner of the track the switching expense; but they continue to accept and switch other roads' traffic at unremunerative rates.

If you will go into this question of switching at large terminals you will be surprised at the magnitude of that service and the loss of equipment by reason of it. In 1868 cars averaged 78 miles per day, in 1898 but 25 miles per day; in 1868 the roads discharged their traffic on their own delivery tracks, to-day industries receiving or forwarding one or two cars per week must have a private spur run into their works in order to save them trucking the freight, and when this industry buys goods from points on other roads it orders cars switched direct to its shop, and the charge made for such switching, I fear, does not in all cases cover even the cost of handling the car to and from, to say nothing of the cost of track occupied and the loss of car while delayed in performing the service. This same condition exists to a great extent on the belt and switch roads, from whom we do not receive a penny for car hire.

It is true that some of the roads, members of this plan, show a slight loss of car hire revenue as compared with the mileage plan, but as the increased movement has been about the same on all lines, the results almost equalize themselves and the benefits are mutual.

When talking this question over with car service officers, they base their objection to it on the ground of how it would have affected their mileage accounts for the past year, which service was performed under the mileage plan, not considering the increased car supply it would afford them and the increased earnings derived therefrom, or that their system of handling cars would be materially improved, so that instead of the conditions being similar both years, they would be directly opposite, and probably under the per diem plan the mileage account would show a better balance in their favor, to say nothing of the increased revenue from traffic.

I also desire to call your attention to one other defect in car interchange. Here is a road short to-day 2,000 cars to move traffic offered; at the same time it has 100 of its cars standing on tracks of connecting line for weeks loaded with traffic for the East on which it requires transfer; the receiving road not having sufficient cars to move its traffic, requests permission to run cars through, advising that if we decline cars may be held indefinitely. We are forced to consent. Now these 100 cars represent $50,000, which is the value of five locomotives; if the receiving road wired us they were short of engines to move these 100 cars, would we consent to loaning them five engines to run through possibly to New England and permit them to hold them on their return until the traffic would warrant their use, or possibly use them in strictly local service while we were losing revenue for want of the engines at home, and when settlement is made, accept 10 or 20 cents per mile run as reported by the borrowing road? I do not think our general managers would consider for a moment the proposition of loaning power to connecting roads when we are short at home; but, allow we were long on power, what then would be the result of action taken? Would not the loaning road dictate the terms and basis of settlement about as follows:

"We will loan the locomotives for a period of thirty days at a per diem rental of $25 per day, the engines to be returned in as good condition as when delivered excepting natural wear and tear; they to be used on the tracks of the borrowing road, and not to be permitted to leave their rails."

If these engines were used by the borrowing road to compete with and take traffic away from loaning road, would the arrangements be duplicated next season? Still we continue to furnish freight cars to take traffic from us at competitive points and allow the borrower to dictate his own terms and settle as it pleases him.

Another objection brought to per diem is the hardship it would bring to roads handling large quantities of low grade freight, for instance, coal, grain, etc., and to export roads.

With a view of determining the cost of storage in cars as compared with warehouse facilities, I cite one known hard coal storage shed located on our tracks in Chicago. This shed occupies 12,000 square feet and track room for 20 cars 12,240 square feet; total 24,240 square feet. This shed will store 10,800 tons of coal, or equal to the capacity of 430 25-ton cars.

Cost of Storage Plant.

Cost of ground, 24 ft. x 240 ft., at $2 per sq. ft.	$48,480.00
Cost of building	5,000.00
Cost of 1,020 lin. ft. of track at $1	1,020.00
	$54,500.00
At 4 per cent	.04
Interest on plant	$2,170.00

Cost of Storage in Cars.

Cost of yard room, 228,330 sq. ft., at 50 cts.	$114,165.00
Cost of 430 cars, at $450 each	173,500.00
Cost of 17,200 ft. of track, at $1 per lin. ft.	17,200.00
	$304,865.00
At 4 per cent	.04
Interest on car storage	$12,194.60
Interest on warehouse storage	2,170.00
Increased interest expense	$10,024.60

Elevator storage to protect 3,000,000 bushels will require approximately 176,000 sq. ft. of ground space, which includes track room to store 80 loaded cars to feed elevator and room for dropping the 80 cars by after unloading; total track room, 160 cars.

Cost of Elevator Plant.

Cost of ground at $2 per sq. ft.	$352,000.00
Cost of elevators (3,000,000 bu.)	500,000.00
Cost of tracks (160 cars), $1 per lin. ft.	6,360.00
	$858,360.00
At 4 per cent	.04
Interest on plant	$34,334.40

To store the same tonnage in cars of 50,000 lbs. capacity would require 3,360 cars, 135,240 ft. of track and 1,785,168 sq. ft. of yard room.

Cost of Car Storage.

3,360 25-ton box cars, at $450	$1,512,000.00
135,240 lin. ft. of track, at $1	135,240.00
1,785,168 sq. ft. of yard room, at 50 cts.	892,564.00
	$2,539,324.00
At 4 per cent	.04
Interest on car storage cost	$101,592.96
Interest on elevator plant	34,334.40
Increased interest expense	$67,258.56

The arguments that I hear against this exchange per diem plan are at least nine-tenths selfish. Car service officials do not stop to consider that the delaying, diverting or misusing equipment is a game that two can play, and when played by both roads the result is a loss to both companies. If the Lake Shore delivered the Illinois Central 10 cars loaded with hard coal for Sioux City Jan. 1, and the Illinois Central delivered the Lake Shore 10 cars of grain for Buffalo same day, that's a fair exchange. Now if we have been in the habit of delaying Lake Shore cars, their car accountant is certainly aware of it, and he is going to handle our 10 cars in the same manner. Hence if we move cars to Sioux City in 36 hours and then permit them to stand under load 27 days and return them in 36 hours, we have his cars 30 days making 1,020 miles, and he affords us the same movement on our cars. The distance being equal, the cars earn an equal amount. That is the present mileage plan of settlement. Now under the exchange per diem, if the Lake Shore moved our cars from Chicago to Buffalo and return in six days, and I continued to permit consignee to hold Lake Shore cars the 27 days, I will owe the Lake Shore a balance of 24 days on each car, they getting the use of my cars practically for nothing, and as I could not afford to continue settlements on that basis, we discontinue the car storage practice and both companies return cars in 10 days, which equalizes itself and results in 200 per cent. improved car service, and no doubt would afford our companies all the equipment required to move promptly traffic offered.

It is not advisable for the Boston & Maine, Old Colony and other New England roads to go into it with the Southern Pacific, Northern Pacific, Oregon Railway & Navigation, as there is little if any car interchange between them. The plan certainly would bring good results if adopted between roads interchanging cars freely, for instance, if the roads in New England adopt it as among themselves, the roads in Southeast territory, like Southern Railway, Central of Georgia, Plant System, L. & N., Q. & C. and other roads in that territory. It would permit of an intelligent test, and by overcoming the existing irregularities in the handling of foreign cars, result eventually in its universal adoption.

Quick Work With a Wrecking Train.

On the Wabash road, at Forrest, Ill., recently, a wrecking train was started out in seven minutes after the notice of the wreck was received, the best time ever made on that division in such an emergency. The report sent to the Superintendent shows:

"One mile south of Wing, freight train pulled out drawbar; dropped on track, causing derailment. Accident occurred Jan. 25, at 7.25 a. m.:

Dispatcher notified	7.42
Shop notified	7.44
Wreck train placed	7.47
Engineer arrived	7.47
Fireman arrived	7.47
Road engine attached	7.48
Conductor arrived	7.48
Last section man arrived	7.48
Last wrecker arrived	7.48
Orders complete	7.47
Wreck train left	7.49

Average running time going to wreck, 40 miles an hour. Two conductors are credited with reporting at 7.46 and 7.47 respectively, though they were not used.

The report indicated by the foregoing schedule of times is made out, in all such cases, in pursuance of an order issued by Superintendent W. A. Garrett, about a year ago, containing instructions for all persons concerned with the wreck train, with a view to producing the best possible co-operation. The order says:

Dispatcher notify shop. Wreck whistle sounded,

full blast, five minutes. Wreckers and section men must report, at train, at dispatchers' office, after sounding of wreck whistle. Call boy must carry at all times a list of crews in charge of the several caboose cars, with their correct addresses and immediately call most available conductor and brakeman. (Use yard switchmen for flagmen, if necessary.)

Shop foreman must keep, at all times, in his possession, a list of crews in charge of the several engines, with correct addresses and send two shop men out to call most available engineer and fireman. Enginemen and trainmen reporting without being called, and used to run wreck train, will receive proper credit, in record book.

Yard crew must bring wreck train in front of dispatchers' office, and attach caboose. If main line, through the yard, is clear, yard crew are available callers, after the wreck train is made ready.

Shop foreman must personally see that road engine is promptly attached to wreck train, that engine has necessary supplies, is properly oiled, and ready for the trip, enabling road crew to start the moment they report for duty and receive orders. The wreck train, going to clear main line, must have right of track over all trains.

Call the following officials: Trainmaster, Chief Dispatcher, General Foreman, Division Roadmaster, and Relief Dispatcher. Wire Master Mechanic if engine in trouble. Call surgeons, if personal injury. Send report promptly to Superintendent. Wreck trains must stand first out on wrecking track.

On each end every Saturday morning, wrecking train must have following attention: Attach engine, test air brakes and inspect couplings; examine and see that journal boxes are in proper condition; examine and know that all rigging, blocks and other material and supplies, are in working order, and test all jacks.

Wreck train foreman will keep record of time arrival of each man at car, and, before leaving Forrest, send list to dispatchers' office, and Chief Dispatcher will wire Superintendent [as in the above case]. All employees will be held to strict accountability for delaying wreck train movements.

80,000 Lbs. Capacity Cars for the Cleveland Cincinnati, Chicago & St Louis.

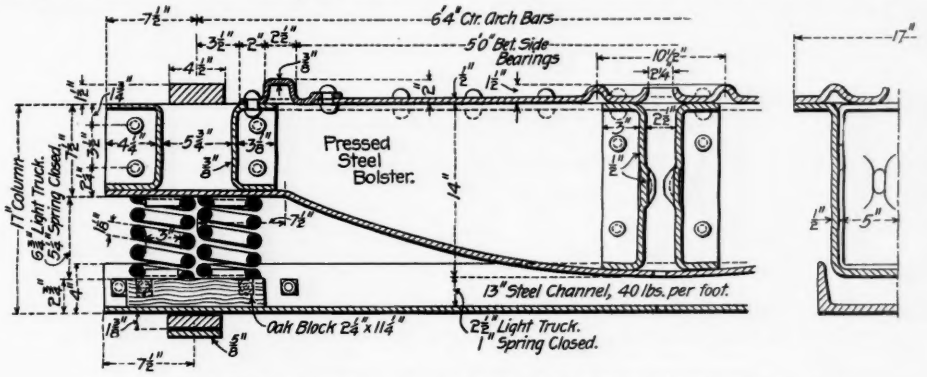
The Cleveland, Cincinnati, Chicago & St. Louis has lately built at the Brightwood shops, 100 gondola cars, and at the Linndale shops 150 flat cars, all of which are of 80,000 lbs. capacity, and were designed under the direction of Mr. William Garstang, Superintendent of Motive Power of that road. The flat cars are 37 ft. long over end sills and 9 ft. wide, while the corresponding dimensions of the gondola cars are 38 ft. and 10 ft. respectively; in other particulars these cars are alike, so that the illustrations and descriptions of the gondola cars apply, with these exceptions, to the flat cars. The full capacity of the gondola cars, when loaded with coal, is obtained by heaping the load at the center 18 in. above the top of the side boards.

By reference to the drawings, it will be seen that the underframe is made up of 5½x9-in. pine outside and center sills, four pine intermediate sills 5x9 in. and 12x10½-in. oak end sills. Six 1¾-in. truss rods are used, each having a bearing on an oak block, 4x7 in., placed above the body bolster and between the sills; the needle beams are of oak, 4x10 in. The flooring is 1¾-in. pine, and the sides are 3 ft. 8¼ in. high, made of pine 2½ in. thick, with inside oak stakes, which extend to the bottom of the sills. The stakes are bolted to the outside sill above, while a wood block is fitted between the lower end of the stake and the intermediate sill, and a long bolt is placed on either side of the stake and block, which passes through both the outside and intermediate sills. All the cars have malleable iron buffer blocks.

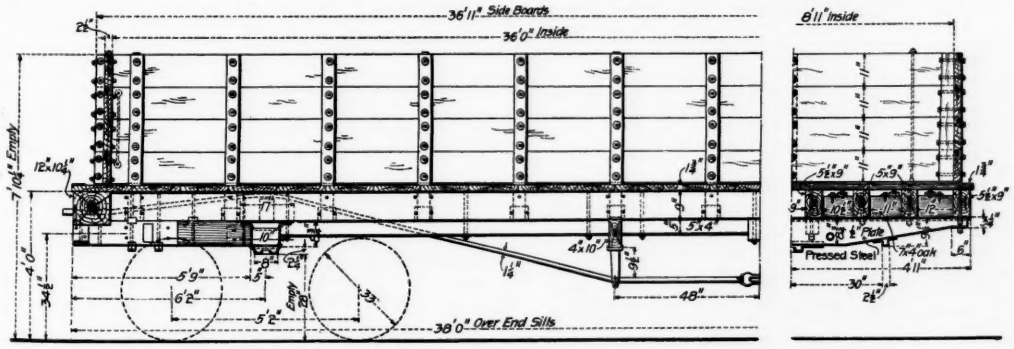
The draught rigging is of the usual type, but strengthened. Three-coil draught springs are used; the outside coil is made of 1 $\frac{5}{16}$-in. round steel, the intermediate of ¾-in., and the center coil of $\frac{7}{16}$-in. steel, the three springs together having a capacity of 32,000 lbs.

The body bolster is trough shape, and formed of ½-in. steel, with a top cover plate ¼ in. thick extending over the entire length. It is 17 in. wide at the top, and 8¾ in. deep at the center and 3¼ in. deep at the ends. Similar designs of body bolsters were illustrated in our issue of Nov. 18 last. The side bearings and center plates are of pressed steel.

The truck used is of the rigid bolster, diamond-framed type, with arch bars, as recommended by the M. C. B. Association for 80,000-lbs. capacity cars. The truck columns are of cast iron, the spring plank is a 13-in. steel channel, and the bolster is of pressed steel, as shown by the engravings. A nest of four coil springs is placed under each end of the truck bolster, and an oak block 2¼ in. thick is interposed between the springs and the channel beam, so that the height of the car can be readily adjusted.



Bolster of 80,000 Lbs. Capacity Cars for the Cleveland, Cincinnati, Chicago & St. Louis.



Section 80,000 Lbs. Capacity Cars for the Cleveland, Cincinnati, Chicago & St. Louis.

These cars have Westinghouse air brakes, National-Hollow inside-hung brake beams, steel axles, with standard 5x9-in. journals and pressed steel journal box lids.

Tests of Locomotive Boiler Coverings.

The results of the tests of locomotive boiler coverings, made last August on the branch line of the Chicago & Northwestern, between Clinton and Anamosa, Ia., were presented in a paper before the January meeting of the Western Railway Club, by Mr. Robert Quayle, Superintendent of Motive Power of that road. The work was done under the general supervision of Mr. W. H. Marshall, Assistant Superintendent of Motive Power, and Mr. F. M. Whyte, Mechanical Engineer, while the makers of the several coverings were represented by Prof. W. F. M. Goss, who assumed control of the data as taken and made the report. The report forms the basis of the paper, from which the following has been abstracted.

In the tests two locomotives were used—one known as the "experimental locomotive," was subject to the varying conditions of the tests; the other was at all times under normal conditions serving to give motion to the experimental locomotive, and as a source of supply from which steam could be drawn for use in maintaining the experimental boiler at the desired temperature. The experimental locomotive was coupled ahead of the normal engine, and, consequently, was first when running, to enter the undisturbed air. The action of the air currents upon it, therefore, was in every way similar to those affecting an engine doing ordinary work at the head of a train.

The boiler of the experimental locomotive was kept under a steam pressure of 150 lbs., by a supply of steam drawn from the boiler of the normal engine in the rear. There was no fire in the experimental boiler, it was at all times practically void of water, and precautions were taken which justified the assumption that all water of condensation collecting in the experimental boiler was the result of radiation of heat from its exterior surface. The whole grate of the experimental boiler was deadened by brick work, and as a further insurance against the movement of air currents through the fire box, tubes, etc., the top of the stack was securely filled with wood. The furnace and front-end doors were also carefully closed and fastened. A steam separator in the supply pipe within the cab of the experimental boiler was assumed to deliver to it steam of a uniform quality. As a safeguard against air pockets and to further insure a uniform temperature of all portions of the interior of the boiler, steam was allowed to waste from it through a small orifice at the end of a pipe connecting with the front end, and leading outside to the top of the stack, and some leak was allowed also at the whistle valve. The loss of steam from the experimental boiler in no way affected the value of the measurements made, since it neither increased nor diminished the amount of condensation taking place within the boiler. The water of condensation was collected and weighed, thus serving as a means from which to calculate the amount of heat radiated.

The locomotive the boiler of which served in the experiments was of the 8-wheeled type, weighing about 90,000 pounds, and the principal dimensions of the boiler are as follows:

Diameter of barrel, in.	52.
Heating surface, sq. ft.	1,391.
Total area of exterior surface, not including surface of smoke-box, sq. ft.	358.
Area of surface covered, sq. ft.	219.
Area of steam heated exposed surface not covered, sq. ft.	139.
Ratio of surface covered to total surface	.61

The values given above are based upon projected areas of the plain boiler. No account was made of the edges of plates at joints, or of surface due to the projection of rivet heads, or to the surface of various attached projections, such as running-board brackets and frame fastenings. The extent of area covered for this boiler is entirely normal for this class of locomotives, which gives added interest to the fact that but 61 per cent. of the exposed surface of the boiler was covered.

The tests made were of two sorts: First, with the experimental engine at rest, which test was known as the "standing test," and the second, with the experimental boiler in motion at a rate of speed approximately 28.3 miles per hour, was known as the "running test." Both standing and running tests were made with the experimental boiler bare, and also when protected by six different coverings. Tests of two of these were repeated, making altogther nine standing tests and nine running tests to be reported. These* are designated as follows: A, B, C, D, D_1, D_2, E, F_1, F_2, and G. "A" represents the test of the bare boiler. "D_1" and "D_2" are different tests of the same covering, and, similarly, "F_1" and "F_2 are tests of a single covering.

The work in connection with each covering occupied, ordinarily, a single day. A test under conditions of rest was first made, followed by a test on the road. Each running test involved a trip from Clinton to Anamosa and return, with an intermediate stop each way at the station of Maquoketa, thirty-eight miles from Clinton and thirty-four miles from Anamosa. By means of these stops it was possible to divide each running test into four parts of nearly equal length, which not only gave opportunity for ascertaining something of the character of the results which were being obtained, but served as a safeguard against the loss of a whole test in case of an accident on the road. There can be no doubt that changes in exposure arising from different conditions of wind had a pronounced effect upon the results of the standing test. For this reason the results of the standing test are believed to be far less reliable for purposes of comparison than those derived from the running tests, for in the running tests the effect of slight variations in wind velocity were swallowed up in the effect of the forward movement of the experimental boiler itself.

A summary of the observed and calculated results is given in Table I.

Table I.—Pounds of steam condensation per minute. (Bare Boiler.)

	A	B	C	D_1	D_2	E	F_1	F_2	G
Standing test	6.78	2.63	3.42	2.91	2.80	3.52	3.04	3.22	3.03
Running test (Speed, 28.3 miles.)	14.27	5.68	5.47	5.03	5.34	5.21	5.29	5.30	5.70

The percentage of the heat trasmitted from the bare boiler, which is saved by any covering, may be obtained by subtracting the amount of condensation for the covering in question from the condensation for the bare boiler, and by dividing one hundred times this difference by the condensation for the bare boiler. The result expresses the efficiency of the covering.

The practice of covering the surface of a locomotive boiler, with its inequalities, with material in such thickness as will give a smooth exterior surface leads to variations in the thickness of the covering, and in the tests an effort was made to have the thickness of all coverings tested the same, and except in two cases this result was very nearly attained. As a comparative figure, an average thickness of all coverings was obtained by finding the volume of the material used, and dividing this by the area of the surface covered. This process gives the thickness which the material would have had if it had been distributed uniformly over the surface covered. The values for efficiency and thickness of

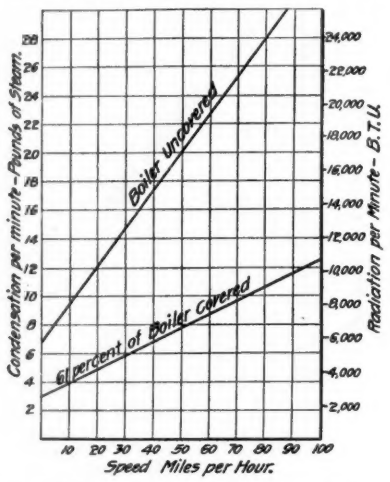
*Those who read this paper and the discussion as published in full in the Club Proceedings will be able to determine the makers of most of these coverings: A is stated to be the bare boiler, and B the plastic covering used by the Chicago & Northwestern; C is the asbestos fire-felt and D_1 and D_2 the asbesto-sponge felted lagging, all of the H. W. Johns M'f'g Co.; E is the lagging of the Chicago Fire-Proof Covering Co. This leaves the F and G laggings, which must necessarily belong to the Keasbey & Mattison Co. and the Franklin Mfg. Co., but there is nothing to indicate which of the two laggings is F and which is G. As Mr. Quayle has not seen fit to give the names of the makers, we refrain from publishing more than is apparent from a reading of the report, discussion and advertisements.—Editor.

coverings were obtained in the ways above explained and are given in Table II.

TABLE II.—Thickness of Coverings and Efficiency, as Disclosed by Running Tests.

	Thickness, In.	Efficiency, per cent.
B	1.34	60.2
C	1.49	61.7
D_1	1.45	64.8
D_2	1.57	62.6
E	1.28	63.5
F_1	1.56	62.9
F_2	1.56	62.8
G	1.49	60.1

The results appearing in these tables are corrected for variations in steam pressure, atmospheric temperature and speed, but not for variations in weather and wind conditions or for variations in thickness of covering. The average efficiency disclosed by the eight tests is 62.3 per cent. The greatest variation from this average is that for test D_1, which represents a 3 per cent. higher efficiency. The results for tests B and G are practically identical, both giving an efficiency of 60 per cent., the lowest value appearing in the series, but only 2 per cent. below the average of all. The result for test D_1, compared with the


Condensation per minute - Pounds of Steam.
Radiation per minute - B.T.U.
Boiler Uncovered
61 percent of Boiler Covered
Speed Miles per Hour.
10 20 30 40 50 60 70 80 90 100
2 4 6 8 10 12 14 16 18 20 22 24 26 28
2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000

The Probable Effect of Speed on Radiation.

others, is high. Omitting these three tests, the remaining five (C, D_2, E, F_1, and F_2), give results which in no case vary from the average of the five by an amount greater than 1 per cent. The conclusion, stated in very general terms, is that any of the coverings tested can be relied upon to save from 60 to 64 per cent. of all the heat which would radiate from the boiler were it not covered at all. A fairly representative result may be stated at 62.3 per cent.

As an aid to a true estimate of the value of results derived from methods already outlined, it will be well to call attention to the following facts:

(a) The same boiler was used in all tests.

(b) The extent of surface covered by each covering tested was the same.

(c) The thickness of the various coverings tested was intended to be the same, but was not so in fact. Variations in this respect, however, were not great. No attempt has been made to reduce results to equivalent results which might have been obtained had the thickness been the same, but when comparisons are made the facts with reference to thickness are made to appear.

(d) The measure of heat radiated under the conditions of each test was determined with great accuracy, the probable error in the running tests not exceeding one in 300, or one-third of 1 per cent.

(e) Variations in atmospheric temperature were carefully observed and corrections have been applied which reduce all results to equivalent results which would have been obtained had the temperature for all tests been the same. Variations in steam pressure have in like manner been accounted for. The character of these corrections make their application entirely safe.

(f) No allowances have been made for changes in atmospheric humidity. The facts, however, in general were noted. No tests were made during rain.

(g) Wind effects probably constitute the most serious disturbing element. The results show that the radiation at a speed of 30 miles an hour was more than double that when the engine was standing. A head wind would have the same effect as an increase of speed in still air, and a wind from the rear the same effect as a decrease of speed in still air. If, however, the force and direction of the wind remained constant during an entire round trip the increased radiation resulting from going against it when moving in one direction would be wholly or in part neutralized by the reduced radiation resulting from moving with it on the return trip. The neutralization would be complete if the direction of the wind was in line with the motion of the train, otherwise it would be partial. As a matter of fact, the direction of the wind was fairly constant for all tests save two, and its velocity was at all times low. The maximum is estimated at between 10 and 18 miles an hour, which, compared with the speed of the train (30 miles), is extremely low.

(h) The purpose of the experiments was not to give results which, as scientific data, would possess a high degree of accuracy, but to give a commercial measure of the radiation losses from a locomotive boiler under conditions of service.

(i) The chief value of the results is to be found in the general conclusions which they may sustain. They are less useful as a means for determining the non-conducting properties of the materials making up the several samples tested.

The results show that the covering of 61 per cent. of the exterior surface of the experimental boiler saves 62.3 per cent. of all the heat radiated from the same boiler under similar circumstances, when bare. It does not, however, follow from this statement that if 100 per cent. of the exposed surface of the boiler were covered, 102 per cent. of the heat lost from the bare boiler would be saved. Such a conclusion must obviously be absurd, though a hasty consideration of the facts presented might seem to justify it. The percentage of the total exposure guarded against was greater than the percentage of surface covered. For this reason, increasing the covered area by 10 per cent. cannot be depended upon as a means of reducing radiation losses by a like amount. It will reduce loss, but the amount of the reduction may be very much less than 10 per cent. It is for this reason, also, that all comparisons in this report have been based upon the boiler as a whole.

Assuming that a locomotive will develop a horse power by a consumption of 26 lbs. of steam per hour, and assuming that the steam thus consumed must be generated from water at 80 deg. F., the radiation losses already given may be expressed in terms of power losses of equal value. Upon this basis the following results are obtained, which apply only to the boiler tested:

Power lost by radiation.

	Horse-Power Equivalent to Radiation Losses.
Bare Boiler:	
Locomotive at rest under conditions of test	12.
Locomotive running 28.3 miles per hour and otherwise under conditions of test.	25.
Covered Boiler:	
Locomotive at rest under conditions of test	4.5
Locomotive running 28.3 miles per hour and otherwise under conditions of test.	9.3

A locomotive similar with that tested may be expected to deliver a maximum of 600 h. p. It is evident that if the uncovered boiler were under conditions of speed, etc., which are not now uncommon in service, that at least 10 per cent. of the total power of the machine would be lost in radiation from its exterior surface. This, then, discloses the extent to which locomotive performance may be affected by radiation. A perfect covering enveloping the entire external surface of the boiler would prevent the entire loss. Actual coverings, such as those tested, extending over a portion of the surface, prevent approximately 62.3 per cent. of the loss. It seems to be a fact, therefore, that a boiler protected in accord with good practice loses power when standing in warm weather, at the rate of four and a half h. p., which amount will increase if the pressure of steam is increased, or the temperature of the atmosphere is reduced, or the engine is put in motion.

The cost of radiation from the bare boiler experimented upon may be stated as follows:

Pounds of coal per hour equivalent to radiation losses, assuming evaporation from and at 212 deg. F. of six pounds of water per pound of coal—	
When standing	60.
When running 28.3 miles per hour	126.
Tons of coal per month, assuming boiler to be under steam standing 200 hours and running 28.3 miles per hour during 300 hours per month	25.
Cost of radiation per year for the boiler tested, assuming the conditions of the preceding paragraph and assuming the price of coal $2.00 per ton	$600

As locomotives are never run entirely bare, the estimated annual loss by radiation, of $600 per engine, is higher than would be likely to occur on any engine in service. It is, however, a statement of the total loss which may occur, and as such will be useful in estimating the value of savings which may be effected by the application of coverings. It has been shown that the several coverings tested have an efficiency which is not far from 62.3 per cent. The annual saving, therefore, which would be effected by the application of any of the coverings would be $600 × .623 = $383.80, the remaining $226.20 still going to waste through radiation. The results show that anything which will increase the efficiency of the covering on the engine tested by 1 per cent. will result in a saving of $6 per annum. This holds for the particular engine tested and for the conditions under which the engine was tested.

The fact should be emphasized that the results thus far given are those derived from the actual experiments. These involved a boiler of moderate size, carrying steam pressure which is now regarded as low, and were conducted in the month of August. It should be noted, also, that the running tests involved a speed of less than thirty miles per hour. It is evident that other conditions, quite common to actual service, would operate to greatly increase the radiation losses described. The effect of changes in some of these conditions will next be considered.

The effect of changes in speed on radiation has long been an open question. It has been argued that a boiler perfectly covered would be, to a very great extent, unaffected by surrounding air currents, and hence that its radiation losses would not be materially greater when the locomotive is at speed than when standing. But those who appreciate the intensity of the cooling currents which circulate about a locomotive when at speed, have been slow to accept such a view, and the tests under consideration confirm their position. They give a measure of the radiation losses, both when the locomotive is at rest and when moving at a uniform speed of 28.3 miles an hour. While these points are not sufficient to establish with accuracy the complete relationship of radiation and speed, an estimate of real value may be based upon them. Such an estimate is presented in the form of a diagram, Fig. 1. The diagram shows that the bare boiler, when at rest, radiates sufficient heat to condense 6.78 pounds of steam, at 150 pounds pressure, per minute, which amount is increased to 28 pounds when the same boiler is driven at a speed of 80 miles an hour. Similar values for the covered boiler are 3.0 pounds and 10.6 pounds respectively.

The results recorded have all been corrected for an atmospheric temperature of 80 deg. Fh. For each 10 deg. reduction in atmospheric temperature below 80 degrees, the radiation may be expected to increase 3.5 per cent. For zero degrees temperature the radiation losses recorded in this report should be increased by about 28 per cent. From this it appears that very low temperatures are attended by radiation losses of considerable magnitude.

The experiments were conducted under a boiler pressure of 150 pounds by gage. With an increase of pressure the boiler temperature will become higher, and the radiation losses will, as a consequence, be augmented. Changes arising from this source, however, are not great. For each ten pound increase of pressure above the limit of 150 pounds the radiation may be expected to increase by about 1.6 per cent., but this will not apply for pressures much above 200 pounds. A pressure of 200 pounds will involve losses by radiation which are 8 per cent. greater than those making up the record of the report.

In reviewing the facts presented in the preceding paragraphs, it will be well to keep in mind the fact that the boiler tested was one of moderate size. Many boilers are now running which present an exposed area which is at least 50 per cent. greater than that presented by the boiler under test, and it should be evident that the losses from such large boilers will be greater than those disclosed by the tests under consideration. For boilers of the same general type the loss will probably be proportional to the exposed surface. It may be assumed that the boiler as covered in each of the several tests involving covering, was as well protected against radiation as is the average boiler of American locomotives, notwithstanding the fact that when thus covered there is still a loss of heat, which in money value annually represents many times the cost of the best covering which the market to-day affords. Improvement is to be found not only in improving the character of the covering itself, but chiefly, probably, in extending the covered area of the boiler and projections attached thereto.

Masonry or Wooden Dry Docks.

A special meeting was held last Friday evening at the house of the American Society of Civil Engineers to discuss the relative merits of masonry and timber dry docks, with particular reference to the needs of the United States Navy. The discussion was opened by Mr. William Ledyard Cathcart, formerly an engineer officer of the United States Navy, now Adjunct Professor of Mechanical Engineering at Columbia University. A very brief synopsis of Professor Cathcart's paper follows:

As to maintenance, the proper basis of comparison is the relative costs of repairs to the structures proper, not including the accessories.

The stone dry dock at the navy yard, Boston, was completed in March, 1834. The record of its repair and maintenance prior to the year 1866 is incomplete and not readily accessible. From that time, however, to Sept. 1, 1897—a period of 31 years—the expenditures for these items were for repair and maintenance of dock proper, $62,000; average, for dry dock proper, per year, $2,000.

The stone dry dock at Norfolk, Va., was built of cut granite, upon the same plans as was the dock at Boston. The early records as to its maintenance are not available. From 1882 to 1897, a period of fifteen years, the expenditures were for repair and maintenance of dock proper, $18,776; average for dry dock proper, per year, $1,251.

The stone dry dock at Brooklyn, N. Y., was completed in 1851. The figures for this dock do not compare favorably with those already given, owing to the character of the soil in which it was constructed and to the quality of the cement used in the joints. Many difficulties were encountered with the foundations, arising from the large springs upon the site, which were never driven entirely from the locality.

Despite these adverse conditions, the total cost of repairs and maintenance to the dock proper, for forty-five years ending with the close of the year 1897, have been but $210,618, or an average of $4,680 per year.

The stone dry dock at Mare Island, California, was completed in 1891. Since that time, up to, and including, the year 1897, the expenditures have been for repair and maintenance of dock proper, $1,613; average for dry dock proper, per year, $230.

The timber dry dock No. 2 at the navy yard, New York, was completed in 1890. The expenditures upon it for the first seven years of its life were, for repair and maintenance of dock proper, $1,982. This would give, during this period, an average cost of repairs per year, to the dock proper, of but $283; but the story does not end here. The timber work of this dock has deteriorated considerably, and a movement inward of the abutments has taken place. The dock, in consequence of these defects, was surveyed by a board of civil engineers in 1898, and its condition was such that they recommended an entire remodeling and reconstruction of the entrance in concrete instead of timber. At its last session, Congress appropriated the sum of $300,000 for making these repairs. If this work be completed in the year 1900, the dock will have cost, for repairs and maintenance, during the first ten years of its life, $317,774, and for the dry dock structure proper, $301,982, or an average of $30,198 per year.

The timber dry dock at the Navy Yard, League Island, was completed in 1891. During its first six years of life, the expenditures upon it were for repair and maintenance of dock proper, $10,202; average for dry dock proper, per year, $1,700.

The upper portion of the timber work of this dock has decayed to a very great extent, and there has been an inward movement of the abutments which

has threatened an increase sufficient to prevent the seating of the caisson in its groove. In view of these facts, Congress, at its last session, appropriated $64,000 for repairs to this dock. If these repairs be completed during the present year, the dock will have cost, within the first nine years of its life, $77,947, total, and the repairs and maintenance of the structure proper, $74,202, an average of $8,245 per year.

Timber dry dock No. 3 at the Navy Yard, New York, was completed in the spring of 1897. In the two years of its existence it has cost $171,000 for repairs, an average of $85,500 per year.

The timber dry dock at the Navy Yard, Norfolk, was completed in 1889. The expenditures upon it to June, 1897, or during the first eight years of its existence, were for repair and maintenance of dock proper, $13,576; average for dry dock proper, per year, $1,697. Since the date given above, however, Congress has made two appropriations for repairs to the structure, aggregating $35,000. These will have been expended within a few months, making the total cost for repairs to the dry dock structure proper, during its ten years of life, $48,576, an average of $4,857 per year.

The timber dry dock at Port Royal, South Carolina, was completed in 1895. For the first two years the repairs upon the dry dock structure proper amounted to $4,262, an average of $2,131 per annum. Since this period, however, about $12,000 have been expended in repairs to the structure, making a total for four years of $16,262, or an average of $4,065 per year.

Disregarding all comparisons, the fact remains that the four timber docks referred to, have cost in repairs to the structures proper, during an average life of eight and one-quarter years, in expenditures and sums appropriated, the large amount of $441,022. The failure of timber dry dock No. 3, at New York, was of a character which could not have occurred in a masonry or concrete dock. There is ground, therefore, for adding the cost of repairs upon its structure to the above amount, which will give a grand total of $612,022, expended in repairs, during a comparatively brief period, to the timber docks proper of the Navy.

Summary of Cost of Maintenance of Docks, Excluding Accessories.

Dock.	Years.	Total	Previous averages, per year.
Stone, Boston	31	$62,000	$2,000
Stone, Norfolk	15	18,776	1,251
Stone, Mare Island	7	1,613	230
Totals	53	$82,389	$3,481
Averages	17⅞	27,463	1,160
Average, dock proper, per year			$1,558
Timber, No. 2, New York	10	$301,982	$30,198
Timber, League Island	9	74,202	8,245
Timber, Norfolk	10	48,576	4,857
Timber, Port Royal	4	16,262	4,065
Totals	33	$441,022	$47,365
Averages	8¼	110,255	11,841
Average, dock proper, per year			$13,364

The $1,558 item is on the basis of 3 docks at 17⅞ years per dock. Similarly, the item $13,364 is based on 4 docks at 8¼ years per dock; $13,364 is about 8½ times $1,558; or, taking previous averages, $11,841 is 10 times $1,160.

A careful analysis followed of a pamphlet issued in 1897 by the Simpson Dry Dock Co.

Commodore Mordecai T. Endicott, Chief of the United States Navy, followed Professor Cathcart in a paper discussing the matter in somewhat general terms, and strongly favoring the building of masonry docks.

Commode Mordecal T. Endicott, Chief of the Bureau of Yards and Docks, followed with a paper, a short synopsis of which we shall endeavor to give.

Commodore Endicott pointed out that the first dry docks were built in Great Britain in the time of Queen Elizabeth. Docks were prepared by excavating in the bank and lining the excavation with timber, backed with clay, and these were fitted with gates. In the time of Charles II., timber docks of considerable size were built. As time went on and larger and better docks were needed, the construction gradually changed, and brick and stone came into service, and there are still on the Thames many docks built of timber, brick and stone in the same structure. In fact, later docks are partly built of concrete also. To-day all of the great docks of Europe are built exclusively of masonry, the construction being the outgrowth of centuries of experience.

The first dry docks built in the United States were begun about 1828, from the designs of Colonel Loammi Baldwin. He built a dock at Boston and one at Norfolk, which were the finest examples of masonry in submarine work in the country. They were founded on piles, built entirely of stone, faced with cut granite. The granite dry dock at Brooklyn, completed in 1854, followed, and then came the Mare Island dock of concrete lined with cut granite.

The timber graving docks of this country originated on the Great Lakes, for private use, where they were begun as early as 1840. In 1854 the first timber dry dock was built on the Atlantic coast at Portland, Me., and others followed, all of them by J. E. Simpson & Co., and this type of dock came to be called the "Simpson" dry dock.

About 1886 the question of building more dry docks for the navy became important, and the timber dock was adopted. The reasons advanced were cheapness, accessibility to the floor because of the gentle slopes and low altars, the width on top, admitting light and air freely, immunity from the effects of frost, and finally greater comfort for workmen in winter weather. A negative advantage urged recently by one of the strongest advocates of timber dry docks is that "it will last 40 years, and that is long enough for anything to last."

The last Congress provided for four timber dry docks, namely, Portsmouth, N. H., Boston, League Island and Mare Island, but authorized the Secretary of the Navy to build one of them of granite, or of concrete lined with granite. The Secretary decided to build the dock at Boston of masonry. Bids opened Jan. 31 of this year showed that a dock of concrete faced with granite could be built at Boston, under the plans and specifications, for about $1,000,000. The result was more favorable than anticipated, and showed "for the first time that the masonry dock could be built of the largest size and the best construction for a sum not greatly in excess of the cost of a timber dry dock of the same general features and dimensions."

The result of this bidding led the Chief of the Bureau of Yards and Docks to believe that the time has come to call the attention of the Navy Department and Congress to the situation, with a view to securing a reversal of the action already taken by Congress in providing for three timber docks out of the four new ones to be built. The general sentiment among officers of the navy who take interest in the matter and have paid much attention to it, is in favor of the masonry dry dock. The matter has been brought up at an opportune time. The timber dry docks are beginning to show that they are temporary and unsafe. The bids for the Boston dry dock show that a first-class masonry dry dock can be built at a moderate increase over the cost of the timber dry dock. The public mind is alive to the subject and strongly in favor of good, substantial, creditable structures for the navy.

A timber dry dock must be practically rebuilt in from 20 to 25 years. The experience of the navy with timber dry docks shows that the expenditures to keep them in condition aggregate finally several times as much as those for masonry docks. The records of the stone dry docks show that repairs to them are very small indeed.

The masonry dry docks last built by the navy have cost much more than was necessary, chiefly because periodical appropriations were made by Congress, causing the work to drag over long periods, enhancing the cost in various ways, particularly in injury to the cofferdams and accessory structures, and in the disintegration of the exposed soil.

In the matter of convenience for use, the timber dry dock and the masonry dock are practically the same. The narrower opening at the top of the dock in the case of the masonry dry dock results in no inconvenience or disadvantage, but, of course, it can be built on the same lines as a timber dry dock, if that were required. In fact, a dock very wide at the coping level has certain disadvantages; for instance, cranes must have long booms. It is not known that any difficulty has ever been experienced in any dry dock from lack of light and ventilation. In the matter of accessibility, stairways can be introduced as often as is desirable.

The greatest danger to a dry dock is the pressure of the water contained in the soil below the level of high tide, acting from without, and this condition can, of course, be best met by a masonry dock. In the nature of things the timber dock cannot be designed or built to meet well this pressure. The only way to preserve the stability of the timber dock is to let the water in and pump it out. This pressure is particularly felt at the entrance works, where the slopes are steep, and to the water pressure is added the thrust of the soil. In many cases the injury about the entrance works has resulted very disastrously, injuring the structure. As the docks increase in depth to take in the big modern ships, this danger becomes greater.

Leaks in timber dry docks always require watchfulness and cause anxiety. Silt and soil may be carried in with the water, undermining the structure. This was the case with Dry Dock No. 3 at the New York Navy Yard.

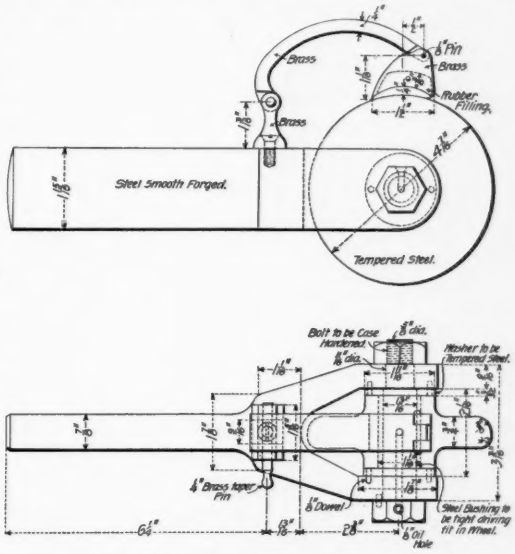
It is of the utmost importance that a dry dock should be safe. Its collapse might prove exceedingly disastrous. A great war ship costing millions of dollars, and carrying hundreds of men, should be put in no dock which is not absolutely safe. No serious accident has ever developed in a masonry dry dock.

The British Government owns or controls 62 graving docks. Only one of these is of timber, namely, at St. John's, Newfoundland, which was built by the Newfoundland Government. France has 36 graving docks, all of masonry; Germany has 11, all of masonry. A large dock recently designed for a private corporation, to be subsidized by the German Government, was to have been built of timber. The government refused to give the subsidy unless it should be built of masonry. Italy has 12 graving docks, all of masonry.

An abstract of the verbal discussion will be given in a later issue.

Journal Burnisher Used by the Missouri Pacific.

The accompanying engraving shows the details of a small tool largely used in the shops of the Missouri Pacific for burnishing the journals of car axles, crank pins and similar surfaces. It consists essentially of a hard, tempered steel roller $4\frac{7}{16}$ in. in diameter, which is free to turn on a short shaft; the shaft is mounted in a frame terminating in a steel bar, $\frac{7}{8}$x1$\frac{15}{16}$ in, for insertion in the usual tool-post of a lathe. After the finishing cut is taken the journals are burnished by means of the roller



Journal Burnisher Used by the Missouri Pacific.

until all tool marks are removed and a perfectly smooth, hard surface is formed. When using the burnisher the speed of the lathe should not be less than 200 revolutions per minute. Journals finished in this way are found to have greater wearing qualities and give less trouble from heating after being placed in service than surfaces finished by the more common methods. The drawings give all the dimensions needed to make these tools.

Ten-Wheel Freight Locomotives for the Southern Indiana.

The Rogers Locomotive Co. recently received from the Southern Indiana Railway Co. orders for three ten-wheel freight locomotives, burning bituminous coal. The descriptive specifications give the following leading dimensions and details:

Fuel	Bituminous coal
Cylinders	18 in. x 26 in.
Drivers, number	Six
" diameter	52 in.
Driving wheel material	Cast steel
Driving axle material	Hammered iron
" " journals	8 in. x 10 in.
Driving wheel base	12 ft.
Total wheel base of engine	23 ft.
Weight on drivers	101,000 lbs.
" " truck	27,000 "
" total	128,000 "
Tubes, diameter	2 in. outside
" thickness	No. 12, B. W. G.
" number	290
" material	Iron
Grate, length	90 in.
" width	42 in.
Boiler, type	Extended wagon top
" diameter, outside front	60 in.
" material	Carbon steel
" working pressure	200 lbs.
" thickness of barrel, " " dome course, " " crown, " " tube, " " side,	$\frac{9}{16}$ in. and $\frac{5}{8}$ in.
Wheels, engine truck, diameter	28 in.
" " " kind	Paige steel tired spoke wheels.
Tender, capacity	4,500 gals.
" frame	Channel iron
" trucks	Diamond arch bar
" wheels, diameter	33 in.
" " kind	Double plate chilled
Safety valves	Two 2¾ in. Ashton
Lubricators	No. 9 triple sight feed
Headlight	18 in. round case, M. M. Buck Co.
Brakes	Westinghouse American
Boiler covering	Magnesia sectional
Metallic packing	Jerome metallic
Couplers	Hein automatic
Bell ringer	Cook air ringer
Tires	4 in. x 5½ in. and 4 in. x 6½ in. Midvale steel
Sanding device	Leach
Injectors	Hancock inspirators
Springs	A. French Spring Co.
Brake beams	National hollow

The Present Status of the Maintenance of Way Association.

On October 21st, 1898, in response to a call issued by the Railway Age, a meeting was held in Chicago to organize an association of those especially occupied in that department of railroad operation known as Maintenance of Way. This meeting was attended by some 20 railroad engineers, and upwards of 100 sent communications approving the movement and expressing a desire to be identified with the organization. Mr. Augustus Torrey, Chief Enginer of the Michigan Central, was chosen Chairman, and Mr. L. C. Fritch, Division Engineer of the Baltimore & Ohio Southwestern at Washington, Ind., was made Secretary.

A Committee appointed by the Chairman recommended that the Association be called "The Ameri-

can Railway Engineering and Maintenance-of-Way Association," and a resolution was passed adopting this name for the Association.

The Chairman was directed to appoint a committee, consisting of five representative engineers or maintenance-of-way officers, to draft a constitution and by-laws, to report at the next meeting. This committee has been named, consisting of Messrs. J. F. Wallace, Illinois Central, Chairman; W. G. Curtis, Southern Pacific; P. A. Peterson, Canadian Pacific; C. H. Hudson, Southern Railway, and Thomas Rodd, Pennsylvania Lines. This committee will report at the meeting to be held in Buffalo in March.

The Secretary has received some 400 or 500 letters from prominent engineers throughout the United States and Canada, expressing great interest and enthusiasm in the organization and desiring to be identified with it, and there is no question but that the organization will prove successful. It seems very desirable that some definite action be taken in this direction. For years the departments of maintenance and equipment and of transportation have been organized and have rendered most valuable services to the railroads and the world. The maintenance of way department, which expends annually a sum greater than the equipment department, ought also to have an organization that will be recognized as the authoritative body, and which will accomplish a work parallel with that now so well done by the American Railway Associaton and the Master Car Builders' Association, and the Master Mechanics' Association.

Deviations in the Results of Cement-Testing.

Several complaints that tests of Portland cement made at the Royal Testing Laboratory, Berlin, showed more unfavorable results than tests carried out by the manufacturers themselves gave occasion for an investigation as to how far the methods of testing affected the results.

The following conclusions are drawn:

(1) In mixing mortar of three parts sand and one part cement, the quantity mixed, up to 9 lbs., does not influence the strength of the specimens. The mixing should continue for three minutes; if longer time be taken the strength is slightly reduced. A small quantity of water gives a high tenacity. Five methods of mixing were tried: Steinbruck's mortar-mixer, with 25 revolutions per minute of the mixing arms, gives the highest tenacities. Mixing with a trowel, the sand particles are reduced in size but little, if at all; in the ball mixer, on the other hand, a considerable reduction takes place. Variations in the proportion of large to small particles of sand, as must occur in practice, have little or no influence on the strength of the specimens. The sand should be well washed, and should contain less than 0.09 per cent. of soluble matter. From the above results it is evident that normal sand should be more clearly defined; it should be taken from the same pit, and should be always under careful control.

(2) The greasing of the moulds should be done with an oil of low viscosity. The quantity of material to be used in each mould should be carefully weighed. Cubes of neat cement are very difficult to make of uniform density. The greatest strength is obtained with 150 strokes of the 4½-lb. hammer. A high speed of the hammer lowers the tenacity, but raises the compressive strength; a standard speed of 50 strokes per second should be used.

(3) To get trustworthy results, tension and pressure specimens should be carefully smoothed off on the upper surface. Tension specimens should be left one-half hour in the mould, pressure specimens 24 hours.

(4) It is recommended that the specimens be hardened in still water, which should be renewed every eight days. Slow-setting cements should be preserved from vibrations, as they retard the hardening process. Newly made specimens should be carefully preserved from air-draughts. In comparative tests of Portland cement the water in which the specimens are hardened should be kept at a uniform temperature; the strength of specimens hardened in warm water is higher than that of specimens hardened in cold water.—Abstracts of Papers, Inst. of C. E.

Tonnage Rating for Locomotives.

The Peoria & Eastern Division of the Cleveland, Cincinnati, Chicago & St. Louis, on Dec. 3 last, put into effect a system of tonnage rating for locomotives based upon the results of extensive dynamometer tests to determine the maximum number of tons that could be hauled in each direction up all the ruling grades. In these tests the dynamometer car jointly fitted up by that road and the University of Illinois was used, a description of which, with illustrations, was given in our issue of Nov. 25 last. The tests were conducted by Profs. L. P. Breckenridge and W. H. Van Devoort, of the University of Illinois, assisted by Mr. E. C. Oliver and certain students of the present senior class, the road being represented at different times by Mr. John McClurg, Master Mechanic; Mr. T. S. Bunn, Train Master; Mr. J. A. Gibson, Road Foreman of Engines; Mr. C. A. Parquette, Engineer Maintenance of Way, and his assistant, Mr. C. S. Millard. The rating established applies to the locomotives on the three districts: Springfield, O., to Indianapolis, Ind.; Indianapolis to Urbana, Ill., and Urbana to Pekin, Ill., in all a distance of 342 miles.

The trials covered a period of three weeks, and were made with special loaded test trains and the two types of freight locomotives used on the Peoria & Eastern, namely, consolidation and 10-wheel engines; in all, seven different locomotives in good average condition, as found in regular service, were tested both singly and as "double headers." In the "double header" tests two engines of the same type were used, and again engines of different types were used together. The principal dimensions of the 10-wheel and consolidation locomotives are as follows:

	Ten-wheel.	Consolidation.
Cylinders, diam ..... in.	19	20
" stroke ..... "	24	24
Driving wheels, diam ..... "	56	50
Boiler pressure ..... lbs. per sq. "	170	140
" diam. at front ..... "	60	54
Firebox, width ..... "	34	33
" length ..... "	78	124
Tubes, number	250	198
" diam ..... in.	2	2
" length ..... ft. "	13-4⅛	11-5
Wheel base, driving ..... ft. "	15-6	15-1
" " engine ..... ft. "	25-8	22-10
" " total engine and tender ft. "	48-8	47-6
Weight in working order on drivers ..lbs.	103,400	88,400
" " " " " front truck "	34,150	16,600
" " " " " total ..... "	137,550	105,000
" " " " " tender ..... "	84,000	71,700

In making the test at each grade the train was started from such a point where, under ordinary circumstances, it might be required to stop. If on the trial the engine stalled under full steam pressure the trial was repeated with fewer cars until the engine was able to haul the train over the top of the hill. If upon any trial the train passed over the summit at a speed greater than 5 miles per hour, another trial was made after adding more cars. The Road Foreman of Engines supervised the working of the locomotives in all tests, to insure uniform handling. Very complete records of these trials were obtained.

The hydraulic dynamometer described in a previous issue recorded automatically the draw-bar pull behind the tender, while in a similar manner an automatic record of the speed was given by a Boyer speed recorder. In addition to these records the following observations were made and noted during each test: Position of mile posts, position of throttle and reverse levers, boiler pressure, temperature, wind and weather, number and kinds of cars, total number of tons hauled by the locomotive, name of the grade and the number and date of the trial.

The accompanying engravings show representative dynamometer records. In the original cards 6 in. horizontally equals 1 mile, and the ordinates indicate the pressure on the piston of the dynamometer in pounds per square inch. The effective area of the piston is 46.024 sq. in., and a reading in pounds per square inch of piston area is conveniently transformed directly into its equivalent draw-bar pull in tons by a large chart on which a straight line is drawn from the origin with such a slope that the abscissæ represent pounds pressure per square inch of piston, and the ordinates the equivalent pull on the draw bar in tons; the use of such a diagram is apparent.

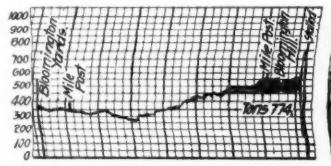


Fig. 1.

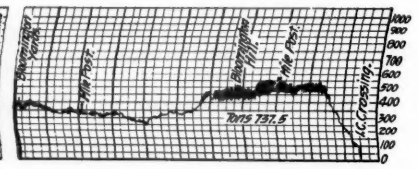


Fig. 2.

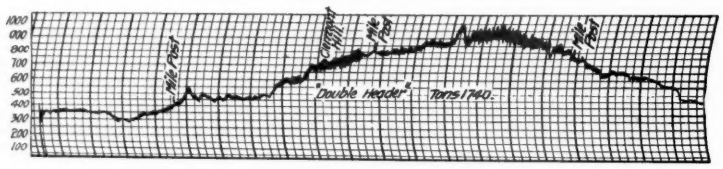


Fig. 3.

Sample Dynamometer Records of Locomotive Tests.

Figs. 1 and 2 show two trials going east with a consolidation locomotive on a 1.3 per cent. grade out of Bloomington, Ill. In the first instance, Fig. 1, the train consisted of 21 cars weighing 774 tons, the speed at the foot of the grade was 9 miles per hour, the boiler pressure was 135 at the foot and 145 lbs. per sq. in. near the top of the grade, and the engine stalled 900 ft. beyond mile post No. 305, exerting a maximum draw-bar pull of 12 tons. In the next trial there were 20 cars, weighing 738 tons, the speed and boiler pressure were the same at the foot of the grade as in the previous trial, and the summit was passed at a speed of less than one mile an hour, the boiler pressure at that point being 140 lbs. per sq. in.; the maximum draw-bar pull in this case was 11.7 tons. Fig. 3 shows a trial going west with a "double header," a consolidation and a 10-wheel locomotive, up Clermont Hill, about 6 miles west of Indianapolis; the grade at that point is a 1 per cent. rise for about 3 miles. The train was made up of 50 cars, weighing 1,740 tons, the speed at the foot of the hill was 23 miles per hour, and when passing over the summit the speed was about 2 miles per hour, the maximum draw-bar pull being 21.9 tons. During this test the boiler pressure was the same throughout, 170 for the 10-wheel and 143 lbs. per sq. in. for the consolidation engine.

These examples will give an idea of the data obtained at all the ruling grades in both directions. This information has all been tabulated in convenient form, and in connection with the profile of the road forms a valuable record. The established ratings were deduced from the results of the tests on the basis that the speed at the top of the grades should be 5 miles per hour. As "double headers" are not as yet run between Springfield, O., and Moorfield, Ind., which is the terminal for freight trains at Indianapolis, no rating was made for such trains between these points. The chart as issued by the road to employees shows three ratings, and of these we reproduce the maximum rating only in the accompanying table, to which we have added two columns showing the ruling grades, as it is impracticable to reproduce the profile of the road on such a scale as to be of any value.

Peoria & Eastern Ry.

Tonnage Rating Between Tender and Caboose.

Between Stations.	Ruling Grade. East.	Ruling Grade. West.	Maximum Rating. Single Engine. East.	Maximum Rating. Single Engine. West.	Maximum Rating. "Double Header" East.	Maximum Rating. "Double Header" West.
District No. 1.						
Springfield‡ and Troy	0 7	0.6	1600	1600	.....	.....
Troy and Ludlow Falls.....	0.6	0.6	1190	1260	.....	.....
Ludlow Falls and Lynn..... ...	0.5	0.6	1190	1080	.....	.....
Lynn and Messick	0.6	0.6	1180	1125	.....	.....
Messick and New Castle.....	0.6	*	1125	1500	.....	.....
New Castle and Kennard.....	*	0.6	1500	1175	.....	.....
Kennard and Hunter	0.4	*	1600	1600	....	....
Hunter and Moorefield.....	0.5	*	1240	1450	...	....
District No. 2.						
Moorefield** and Crawfordsville	0.2	1.0	1480	1630	2700	2700
Crawfordsville and Veedersburg	0.9	0.8‡	910	900	1645	1630
Veedersburg and Covington....	1.0	0.9	800	900	1475	1630
Covington and Danville.....	*	0.8	1600	810	1475	1600
Danville and Urbana.....	*	0.6	1600	1225	2300	2300
District No. 3.						
Urbana and Rising.....	1.2	0.7	1145	1175	2060	2115
Rising and Mahomet	0.8	†	1145	935	2060	1680
Mahomet and Gillem	*	0.3	1500	1500	2700	2700
Gillem and Bloomington	1.3	1.0	1080	1095	1935	1870
Bloomington and Danvers.....	1.3	1.3	825	725	1485	1305
Danvers and Lilly.....	0.5	1.3	825	800	1485	1475
Lilly and Tremont..... ..	1.3	1.1	695	760	1250	1370
Tremont and Pekin††	1.4	1.4	695	695	1250	1250
Pekin and Peoria	.....	.....	1500	1500	2700	2700
Through Rating.						
Springfield and Indianapolis....	0.6	0.6	1125	1080	.....	.....
Indianapolis and Urbana	1.0	0.8	800	810	1475	1600
Urbana and Peoria.....	1.3	1.1	695	760	1250	1250

* Grade continually descending.
† Starting resistance governs.
‡ Helper into Springfield yard for trains over 900 tons.
** Helper west out of Moorefield for trains over 910 tons.
†† Helper east out of Pekin for trains over 700 tons.

It will at once be noticed that a single rating is established for all engines. This greatly simplifies making up trains and was warranted by the fact that the hauling capacity of the two classes of locomotives was practically the same. It was found that there existed as much difference between the capacity of different engines of the same type as between the two types tested, and that in some cases one type and in other cases the other type had the greater hauling capacity. It was also found that the hauling capacity of a "double header" was from 7 to 10 per cent. less than that of the two engines singly.

Three ratings were deemed sufficient for variations in temperature, weather and engine condition, a maximum, mean and minimum. The maximum rating given in the table does not represent the greatest hauling capacity of a new locomotive under the

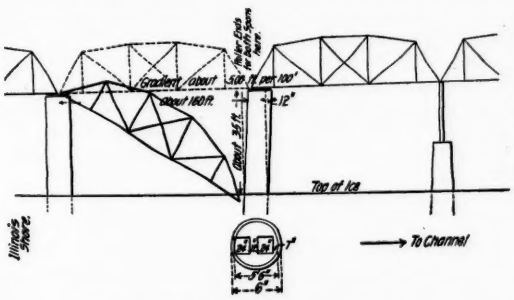
most favorable conditions, but it simply indicates the number of tons of loaded cars, excluding the caboose, that can be hauled by an engine in average condition, when the rail and weather conditions are favorable. The mean rating applies to conditions of high winds in mild weather, wet or frosty rails, or temperatures from 10 to 32 deg. Fahr. This rating for single engines was obtained by reducing the maximum rating by 10 per cent. In the same way the minimum rating for single engines was got by reducing the maximum by 20 per cent., and applies to temperatures below 10 deg. Fahr., with high winds. The rating for "double headers" was established by adding the rating of any two single engines and reducing this by 10 per cent. Those who are interested in tonnage rating for locomotives can undoubtedly obtain the results of these tests in greater detail upon application to Mr. J. A. Barnard, General Manager of the road.

Prof. Breckenridge says that during the three weeks the dynamometer car was in use there was never a failure to obtain a record of the draw-bar pull and no delay was ever caused by failure of the recording apparatus. He is more than ever convinced that the frictional resistances of the dynamometer, which is built with "U" packing leathers around the piston, are so small as to be entirely neglected. The friction of such packing is a point about which there is a wide difference of opinion. Some interesting data were also obtained on curve resistance and the forces required to accelerate and maintain speed on a level with the various trains, but these tests have not as yet been worked up.

Fall of a Highway Bridge.

The west end of the second span (from the Illinois side) of the Muscatine Highway Bridge over the Mississippi River, at Muscatine, Ia., fell from its position on Saturday afternoon, Feb. 4, under two loads of cord-wood, which, with the teams and drivers, made a total load of about seven tons. The failure was caused by the improper placing of the cylinder piers, and by failure to prevent the movement of these piers toward the channel. The cylinders are now about 1 ft. out of plumb, in a height of 35 ft., and have been out of plumb for some time. The fact that the end plates are much nearer the east than west side of piers would indicate that the pier was not plumb when the bridge was built.

The end of the bridge slipped from the rollers which



Fall of Bridge Span at Muscatine, Ia.

were left on the bed plate. The span is, apparently, damaged but very little, the laterals and end floorbeam being bent a small amount. The accompanying sketch shows the position of the fallen span before and after the accident. The accompanying engraving is from a photograph taken two days after the bridge had fallen.

Wages and Hours of Grand Trunk Telegraph Operators.

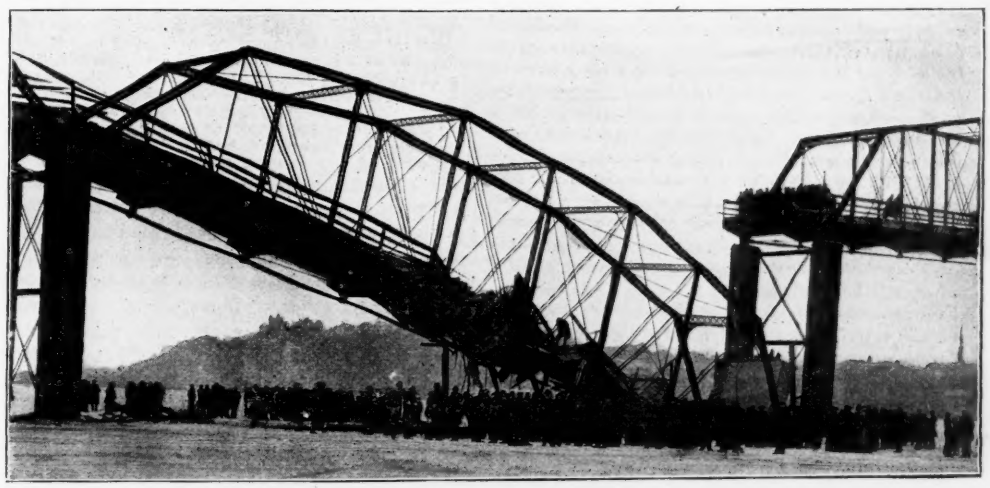
The report of the arbitrators who recently settled the grievances of the telegraph operators on the Grand Trunk Railway of Canada was noticed in the Railroad Gazette of Feb. 3. Below are details, taken from a Canadian newspaper, which in some features do not agree with the statements first published.

The arbitrators unanimously find:

1. That rules 20, 21, 22 and 26, as altered, changed and amended, shall be and become rules of the Grand Trunk Railway Company; the changed rates of salary, etc., shall come into effect on Jan. 1, 1899. The arbitrators have considered a list of salaries paid at stations and have settled the same as per schedule annexed.

Telegraphers who are required to remain on duty outside of their regular hours will be given an official order as authority, and excused in the same manner. Overtime will not be allowed unless overtime tickets are mailed to the proper official within forty-eight hours from the time the service is performed. If overtime is not allowed, telegraphers will be notified within 10 days from the time such service is performed, setting forth the reason why. Rule 20—At offices where only one telegrapher is employed, twelve consecutive hours, including meal hours, will constitute a day's work. At offices where only two telegraphers are employed, 12 consecutive hours, including meal hours, will constitute a day's work. At offices where more than two telegraphers are employed, 10 consecutive hours, including meal hours, will constitute a day's work. If telegraphers are required to remain on duty, exceeding above named hours, they will receive overtime under rule 21, except as hereinafter provided by rule 22. Rule 21—Overtime will be computed pro rata on a stated salary, but in no case less than 15 cents per hour. In computing overtime less than 30 minutes will not be counted. Thirty minutes and less than 60 minutes will be considered an hour. "Emergency calls," and up to one hour's service connected therewith, shall be paid at the rate of 35 cents per call.

Rule 22.—This rule, with its sub-sections, applies to branch lines only. (1) Where one telegrapher only is employed, and the time of the regular scheduled passenger, mixed or way-freight trains is so arranged as to require the telegrapher, in order to meet them, to be on duty beyond 12 consecutive hours, he will receive the following sums per month, to be added to his salary: If required to meet such trains after three and within four hours, $4.50. If required to meet such train after two and within



The Highway Bridge at Muscatine, Ia., After the Accident on Feb. 4.

three hours, $3.50. If required to meet such train after one hour and within two hours, $2.50. If required to meet such train within one hour, $1.50. Fractions of an hour to be computed as in rule 21. (2) An employee, whose salary, including receipts from all sources during the preceding year, exceeds $50 per month, will not be entitled to additional allowance provided for by this rule. (3) An employee will not be required, except for the purpose of "emergency call," to be on duty so as not to leave him eight consecutive hours off duty in 24. (4) Extra pay provided for by this rule is to compensate operators for inconvenience; their 12 hours' duty not being consecutive, and is not otherwise to interfere with allowances for overtime under rules 20 and 21.

Rule 26—The minimum monthly salary will be as follows: Agent and telegrapher, with dwelling, light and fuel, $38 on main line, $35 on branch line; agent and telegrapher, without dwelling, light and fuel, $43 on main line, $40 on branch line; telegraphers, $38 on main line, $35 on branch line; relieving agents, who are on the permanent staff, and are telegraphers, $50 on main line, $50 on branch line. 2. For the purposes of this rule, the following shall be deemed main lines: Portland to Sarnia; Suspension Bridge to Windsor; Komoka to Sarnia; Hamilton to Toronto; Fort Erie to Glencoe; Toronto to Gravenhurst.

Modern Rolling Stock.

Mr. W. McIntosh, Master Mechanic of the Chicago & Northwestern, presented a suggestive paper at the December meeting of the Northwest Railway Club. It was shown that since 1886 the mileage of railroads in this country has increased 38 per cent., the tonnage carried has increased 37 per cent., the number of cars 33 per cent., and the number of locomotives 27 per cent. The small percentage of increase in the number of locomotives is considered to be due to the greater hauling capacity of the modern engine. The assertion is ventured that a track and road bed that will carry locomotives of 100 tons and cars of 50 tons capacity will soon be among the necessities. That, while the lowering of grades and improvements of road bed within the limits of current expenditure have helped, the introduction of heavier cars and engines has furnished the most effective means of reducing the cost of transportation. The times were propitious for this change, as the equipment of many roads was old, and replacement was in order. Continuing, Mr. McIntosh said in part: Substituting heavier engines and cars involved only the difference of proportion between the light and heavier ones, though the additional earnings of the new showed up so favorably that some lines found it profitable to sell off their small engines as far as possible, and lay up others until they could be disposed of, in preference to continuing them in use. Old cars with small margins of value were dropped out by the score, and replaced by new ones of twice their capacity, which, when hauled by the modern locomotive, greatly simplified the transportation problem. Twice as many tons of freight were switched in the same yards, moved by the same number of trains with the same crews, passed on the same sidings; the same shops providing facilities for repairs, and the same round houses accommodating the larger engines; while the problem of moving a given amount of tonnage over a single track line, or even a double track road, was greatly simplified for the operating department.

With the development of modern rolling stock attention was called to the unsatisfactory system of loading locomotives, by giving them a stipulated number of cars to haul without knowing what the total tonnage amounted to, one train would be handled easily and the next one would stall the engine on the first heavy grade. Considerable friction naturally existed among all parties connected with the movements of trains under this plan, and often an engineman fell into bad repute with the operating officials when trying to do his best. The tonnage system of rating engines, giving them a known load, largely overcame the difficulties. The traffic department is credited with learning a few things with the adoption of tonnage rating. It was discovered that many cars were being sent out on long trips with but a few tons of some special freight that could not wait for the slow way freight distribution that only took place on day runs. A new plan was adopted, a zone system, that is, goods for zones A, B, C and tributary points were loaded promiscuously into cars at shipping centers and sent forward by fast freight, overhauled on arrival at A, B and C, put in station order and sent forward again for local distribution within a few hours, thus reducing the distance lightly loaded cars were hauled to the minimum, and expediting the distribution of goods, greatly to the satisfaction of the patrons and their own advantage.

There is a limit even to the capacity of modern equipment. In the case of cars this can be fairly approximated by calculation and close observation, noting wear and tear, undue strain, etc. It is different, however, with the locomotives; many variables complicate the problem. The aim of operating officials is naturally to move as many tons of freight as possible with the locomotives assigned to their districts, financial results being of course the chief consideration, but comparisons with other divisions and other roads spur them up to make a favorable showing. It is doubtful, however, if the most economical results are obtained by loading locomotives to their utmost capacity; there is a line beyond which the load and speed cannot be increased without excessive consumption of fuel and undue wear and tear on machinery and boiler. There are other unfavorable effects that follow excessive loading, such as abnormally slow movement of trains, stalling, doubling hills and increased liability of accidents, which usually develop under such conditions. This proposition is more or less indefinite, and the possible results cannot be measured directly in dollars and cents, but that they exist any practical man will agree, and it may be asked whether a large price is not often paid for the "last straw" or few tons of freight that constitute its equivalent.

It costs money to start and stop heavy trains, ranging in weight from one to three thousand tons. This is a difficult problem to wrestle with, but the importance of coming as close to ideal conditions as possible is not always given the consideration it deserves. Enginemen make stops that could be avoided, and conductors likewise; even operating officials have been known to stop a heavy freight train at the foot of a grade to jack up the crew for some act of omission or commission that might have been explained at some more convenient place. The difference between a stop of this kind and allowing the train to continue under headway often amounts to a serious loss of time and the burning of an extra ton of coal. The work of setting out and picking up cars at such places should be delegated to as few trains as possible, while stops for technical matters, such as clearances, blocks and orders, should be waived as far as consistent with safety. Coal and water stations are sometimes found at the foot of grades, and were the cost of stops figured up it would probably be shown that a move could be advantageously made to some other station where the expense of stopping would not be as great. In this connection large tenders show up to a good advantage; ample supplies of coal and water are necessary adjuncts to a long run, and while the modern engines are fairly well supplied in this respect, still larger ones will probably be supplied to meet the demands in this direction.

There are many cars building of 100,000 lbs. capacity, and it is not too visionary to predict that the enormously increased earning capacity of this equipment, as compared with the old, will be so pronounced that such types will be largely ordered in the future. This will not long be a matter of choice, but will become a necessity; even the conservative Lake Shore road has fallen into line and is ordering large engines to utilize to the greatest advantage its unequaled road bed.

We can soon go to Ararat, or to its vicinity, by rail. The Russians began in 1896 the construction of a line from Tiflis, on the Transcaucasian Railroad, southwest 185 miles to Kars, a fortified place, near the Turkish border, and until recently in Turkish territory (captured in 1877), through a mountainous country. Kars is 5,689 ft. above sea level, which is 4,300 higher than Tiflis. There are 13 tunnels and 17 large bridges on the line. At this time the roadbed is nearly completed, and 120 miles of track laid, but the formal opening of the road is to be next September. The railroad is chiefly important for strategic purposes. It has cost about $10,000,000.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Here is a fine example of the 24 o'clock system in action. A recent notice, sent out by the American Society of Civil Engineers, said that "on the evening of Friday, February 10, 1899, at 20:30 o'clock, a special meeting will be held at the Society House, at which an informal discussion on 'Dry Docks—Stone vs. Wood,' will be opened. . . . It is expected that Commodore Geo. W. Melville, Engineer-in-Chief, Bureau of Steam Engineering, U. S. N.; Commodore M. T. Endicott, M. Am. Soc. C. E., Chief, Bureau of Yards and Docks, U. S. N., and other officers will be present." A gentleman in New York, who wrote to make an appointment with Commodore Melville, received this reply: "When does your Special Dry Dock Meeting begin? On the notice is printed 20:30 o'clock, which may mean 2:30 o'clock. It is evidently a mistake of some kind. As I have to catch a train in time to get to the meeting, will you please put me straight on this matter by return mail?" The necessary explanation was made verbally and graphically, with this result: "Your note of the 8th received, with diagram of the hour at which the meeting will be called, and I am now all straight in the matter. After sending my letter to you, and looking at the notice more carefully, it dawned on me that the 24-hour system was used; but it's clear beyond doubt now." And this is the result of twelve years of effort to make the world reckon time in the way you think it ought to be reckoned! Surely no one ever accused Commodore Melville of slow wit or dull observation or feeble memory. And yet he never suspected that the great American Society of Civil Engineers uses the 24 o'clock notation. The blood of the martyrs is sometimes spilled in vain.

A New Train Resistance Formula.

In the Street Railway Journal for February is "an editorial announcement of the discovery" of a general formula for train resistance of wide range, but which is claimed to be especially applicable to passenger trains of from 20 to 400 tons weight, running at all speeds from 10 to 75 miles an hour. This formula was reduced by Mr. John Lundie, from the results of more than 150 trials made with trains of cars, varying in weight from 20 to 100 tons, on the South Side Elevated Railroad, Chicago, and the formula is as follows:

$$R = 4 + S\left(0.2 + \frac{14}{35 + T}\right).$$

Where R = resistance in pounds per ton (2,000 lbs.).

S = speed in miles per hour.

T = the weight of the transportation unit.

By the term "transportation unit," we suppose that the entire train is meant, that is, in the case of steam railroads the locomotive, tender and cars, and in the case of electric traction the motor car, or cars, and the trailers. We are led to this conclusion, because where comparisons are made with other tests the gross weights of those trains are used. This is a point, however, of such importance that the reader should not be left to guess at the correct meaning.

As to the methods of making the tests we are told: "His methods of obtaining data are decidedly different from, and much more satisfactory than those commonly employed hitherto, where indicator cards of engines drawing trains at constant (?) speed on level (?) track have been made the basis (with an arbitrary allowance for engine friction) of estimates of resistance per ton moved. In order to be of any value such tests must be made in long distance runs, and it is almost impossible to find a hundred miles or more of absolutely level track for the purpose, while it is also difficult to obtain perfectly uniform speed even on a dead level. Mr. Lundie's method of determining train resistance is based on an examination of the speed curves of a train when coasting from any speed to a dead stop. The possibilities of such a method will be instantly evident to an engineer, and it may be said, at once, that the results warrant a decided predisposition in its favor. It is not only possible to obtain the gross resistance due to track and journal friction and air resistance combined, but to differentiate between the air and the friction elements."

It is also said that the speed records were obtained by "positive methods," but we are not told what the methods were which measured this essential factor. From a sample diagram, we judge that the car or cars were started on a level by the electric motors and accelerated to a speed of something over 20 miles an hour, when the train was allowed to coast down a short 0.28 per cent. grade and thence on to a level stretch until it came to rest; the time from start to stop being about 2½ minutes.

Certain Results of Train Resistance Tests.

Test Made by	On	Average Speed, Miles per Hour.	Train Weight, Tons.	Train Resistance, Lbs per Ton.	
				Observed.	Lundie Formula.
Wm. Stroudley.	London & Brighton.	*43.3	376	13.2	14.1
Angus Sinclair	New York Central.	†70.	270	19.03	21.1
" "	" "	*69 6	270	19 8	21.2
P. H. Dudley	" "	*51.43	313	16.9	16.35
" "	Phila. & Reading.	*60.	242.5	18.35	19 0
" "	" "	*63.5	242 5	19.8	19.9
" "	C. R. R., N. J.	*63.2	213	19.0	20.2
Clark formula			10	100	7 74	7.04
" "			10	200	7.74	6.6
" "			10	300	7.74	6.4
" "			20	100	9.5	10.06
" "			20	200	9.5	9.2
" "			20	300	9 5	8.8
" "			30	100	12 42	13.1
" "			30	200	12.42	11.8
" "			30	300	12.42	11.3

*Single tests; † mean of six tests.

A table comparing the results of some previous tests with those given by Mr. Lundie's formula is reproduced, concerning which this statement is made:

"These tests (with which comparison is made) are all for heavy railroad passenger trains upon which Mr. Lundie has made no experiments. . . . For light units, the formula agrees with the results of private tests made by several of the great electric companies, and checks very well indeed the Clark formula, $R = \frac{S^2}{171} + 7.16$, bearing in mind that the latter is generally admitted by engineers to be from one to two pounds too high. . . . It seems practically certain, therefore, that the Lundie formula is thus applicable to the whole range of passenger train traction on straight, level, exposed track in a calm atmosphere. It cannot, however, be said to be applicable to street cars running on gritty or dirty rails, and, in fact, it is unfortunately too probable that no formula whatever can be devised for street railway work for which a large factor of safety would not have to be allowed in practice to provide for great differences in condition of track."

In view of this statement we shall not attempt to compare the new formula with data from street railroad practice, but shall consider it as only intended for such conditions as are now found in elevated and intersuburban service and passenger service of steam railroads.

Our first thought upon reading this article was that those interested could well have spent some time in studying previous investigations of train resistance, and then much of the article would probably have been left unwritten. Without entering into a prolonged discussion of the merits of the methods used by Mr. Lundie, we will merely say that they are by no means new and that it is a matter of record that similar methods have been used in many instances by Continental engineers, and, to some extent, by engineers in this country. Thus Von Weber, in Europe, as early as 1855 and 1856, made experiments by imparting to a car an initial momentum and letting it run until it stopped; Welkner made similar experiments by running cars down grades; and on the Eastern Railroad of France, Vuillemin, Dieudonné and Guebhard in a similar manner made extensive tests on both cars and locomotives. In this country the late A. M. Wellington made many tests by dropping cars down grades.

The objection which has been raised to this method is that where the cars are acted on by gravity alone, the tensions in the couplings and the resistances due to shocks are quite different from those actually occurring in the usual running of trains on a level track, beside which the velocity is constantly varying. The best opinion on this point is that a recording dynamometer behind the tender, together with indicator diagrams, furnish the most satisfactory means for obtaining data regarding train resistance. Furthermore, an experienced investigator would hesitate to base a general formula upon the results of tests so limited in scope as these, and especially where so little effort was evidently made to learn what had previously been done. Some of the most noted mistakes of engineers can be traced directly to reasoning from insufficient data and assuming that the relations established within the limits of the experiments apply equally as well to conditions beyond the scope of the tests.

The Lundie formula, it will be noted, includes the weight of the train as a variable, which is by no means new, as Rankine, Searles, Wellington, Henderson and others have introduced the weight of the engine and train into their formulas in various ways. However, in many cases heretofore this factor has not been used because the particular expression derived from any series of experiments has been taken to apply only to conditions very similar to those of the tests, and for the narrow range of conditions the introduction of this factor has been found to be of little importance. In any approximate general formula the weight of the train should enter, while several other factors should appear separately, but general expressions are now not so much desired as more limited and more specific ones. A well informed correspondent, writing on this subject about a year ago,* suggested that the most useful train resistance formulas would be those where each applied to but one class of locomotives and one class of trains, and named seven kinds of passenger and freight trains known to have widely varying resistances. In view of these things what purports to be a general formula fitted to every kind of equipment from street cars to heavy sleepers and which takes account of but two variables, speed and weight, should not be accepted hastily, but only after a comparison with the best available data.

The results of the new formula, when compared with the results of certain noted experiments given in the table previously referred to, appear to check quite closely, but in passing it might be noted that Clark's well known formula is misquoted, and as wrong co-efficients have been used in the calculations the values in the table derived from Clark's formula are slightly in error. If Clark's formula for the resistance of the locomotive and entire train, which is usually given in terms of long tons, is transformed into units of net tons, the following results will be obtained: At 10 miles an hour, R equals 7.66 lbs. per ton; at 20 miles an hour, 9.24 lbs., and at 30 miles an hour, 11.84 lbs. These corrected figures agree even more closely with those given by the Lundie formula. The fact that all the tests quoted have from time to time been criticised on the ground that the results were too high, leads us to believe that the Lundie formula is also open to the same objection, when modern equipment and high speeds are considered. We do not assert that this is so, but that it is probably true is shown by a comparison of the new formula with that derived and used by the Baldwin Locomotive Works, namely,

$R = 3 + \frac{V}{6}$, where V is the speed in miles per hour.

Mr. Vauclain has at different times made statements that would warrant the application of the Baldwin formula to the conditions of the fast passenger trains on the Chicago, Milwaukee & St. Paul and the Atlantic City Railroads. The gross weight of the Chicago, Milwaukee & St. Paul train has been reported as being 600 tons. By the Baldwin Locomotive Works formula the entire train resistance at 45 miles an hour is 10.5, and at 75 miles an hour 15.5 lbs. per ton; by the Lundie formula the corresponding figures are 14 and 20.6 lbs., respectively, being increases of about 33 per cent. Taking the Atlantic City train as weighing 322 tons, the entire resistances by the Lundie formula at 45 and 75 miles an hour become 14.7 and 21.9 lbs. per ton; in this case the results being about 41 per cent. higher than those given by the Baldwin formula. It should also be noted that while the weights of the trains in these cases differ by 86 per cent., the resistances per ton by the new formula vary only about 5 per cent., showing how small is the effect of the weight of the train

*Railroad Gazette, February 18, 1898.

within the limits and conditions of the Baldwin tests.

It might also be well to state that we are inclined to give great weight to the formula of the Baldwin Locomotive Works for high speeds because its results have been repeatedly confirmed by the performance of modern locomotives; it checks quite closely, being a little higher than a line laid down by the late D. L. Barnes, as the result of an earlier investigation, and for the past two years the Baldwins have designed and built under guarantee many fast passenger engines, using this formula as the basis of the calculations, and we are informed that these engines have in all cases met the requirements. These reasons are not conclusive, but are ample to warrant the opinion that for high speeds the Baldwin formula gives results for train resistance quite high enough, and that it is probably more accurate for present conditions than any other equation so far presented.

Few data concerning the resistance of trains on elevated roads are available, but Mr. S. H. Short in 1897 made tests in such service and reported that the tractive effort in pounds per ton required to maintain a constant speed with different trains on level track was as follows, and to these conditions we have applied the Lundie formula:

Weight of Train. Tons.	Speed. Miles per Hour.	Tractive Effort. Lbs. per Ton.	Resistance by Lundie Formula. Lbs. per Ton.
28.5	26	25	14.9
51.5	31	19.7	15.1
74	32	18.3	14.4

As Mr. Short's tests were not made with the sole object of determining the train resistance, this comparison is by no means a satisfactory one.

In somewhat similar service, namely, on interurban roads laid with tee rails, Mr. S. T. Dodd has made rather extensive tests for the purpose of determining the resistance of electric motor cars and trailers. The results of these tests were presented in a paper before the Civil Engineers' Club of Cleveland, in 1898, from which the following table has been compiled, adding in each case the result of the Lundie formula; it will be noted that the agreement is often far from close under conditions where a confirmation might be expected:

Weight of Train. Tons.	Speed. Miles per Hour.	Resistance. Lbs. per Ton.	
		Observed.	Lundie Formula.
20	25.9	23.5	15.7
20	32	25.0	18.5
20	47	28.0	25.4
35	27	17.7	14 8
35	40	25.0	20.0
50	25	16 0	13 0
50	37 6	18.5	17.5
95	31.8	18.3	13.8

The reason given why this new formula has little application to street railroads in cities is probably sufficient. That Mr. Lundie's tests do not confirm some other trials made in similar service is evident, although this may merely go to show that more work is required before any definite conclusions can be reached as to the approximate resistance of trains on elevated and interurban roads. We know, however, of no reason why Mr. Lundie's results should not have equal weight with the results of other tests in the same service, but it is unreasonable to expect or claim more than this. The tests certainly add little to the useful information about the resistance of trains or the methods for making such tests on railroads operating heavy cars and locomotives, and probably it has been made sufficiently apparent that the formula is of a common form and of quite limited application.

Scientific Forestry in New York.

The State of New York will make an experiment of scientific forestry which is of great importance. It is possibly the first trial ever made in this country to determine the commercial results of cultivating timber under conditions which will cause the results obtained to be of general practical value. In saying this we are not unmindful of Mr. Gifford Pinchot's interesting development of the Biltmore property in North Carolina, and of his valuable report upon it, but the conditions under which that development has been made were special, and not general. There is also a possibility of further experiments resulting from an offer made during the past year by the Forestry Division of the United States Agricultural Department to all owners of timber land. The terms of this offer are, in general, to make surveys and furnish opinions, directions and, in some cases, supervision of timber culture. Substantial results from this proposed partnership investigation are to be hoped for rather than to be expected.

Under a special act of the New York Legislature the State has bought 30,000 acres of timber land in townships 23 and 26, Franklin county, and placed its management under the control of the new State College of Forestry at Cornell University. It is in the Saranac Lake region, has navigable water connection with the railroad, and its average distance from the Adirondack Division of the New York Central and Hudson River Railroad is about eight miles. This is important, because it is a fixed fact that no successful hardwood lumbering can be done without cheap transportation. To be more exact, although it is dangerous to make exact statements on this subject, it is generally true that the birch, beech, maple, and black cherry in the Adirondacks cannot now be profitably taken out unless the teams can make more than one trip a day. Throughout this tract there is a short team haul to water, where flat boats can take the logs to the railroad.

For more than one reason it is a matter for congratulation that Professor B. E. Fernow, Director and Dean of the State College of Forestry, will have charge of the cutting, marketing, and subsequent planting of the timber trees at this experiment station. During his long service as chief of the Forestry Division at Washington, he made a general and a minute investigation of the forestry abuses throughout this country, and his reports fairly cover the whole subject of how forestry should not be conducted. Concerning the strength of timber and the hitherto little-known value of certain kinds of timber, he has published many essays and reports that have value, but with regard to the profitable and continuous farming of timber lands his reports have often expressed doubt as to whether the economic conditions were yet ripe for it. He now has his hoped-for opportunity to show, if it can be shown at the present prices of labor and of stumpage, that a forest property can be managed profitably for continuous wood-crops.

The chances of his success in this have nothing to do with the case. The tie-timber, the cabinet woods, as well as the soft woods, are disappearing from this country, and unless the cuttings can be at least partially replaced by new growth, there is a great problem surely but slowly looming up; one which seriously affects the economic conditions of many industries. Its solution is, as we view it, one of the functions of government, rather than the responsibility of private enterprise.

Professor Fernow expects confidently to make this experiment not only self supporting, but to have his cash account with the State show a balance of receipts over expenditures. He will, at least, in conducting this experiment station, undertake to make exhibits of the profit or the loss of various specific undertakings in forestry; of the rate of growth of valuable trees under described conditions, as well as of the different methods of planting, care, cutting, and marketing with a view to continuous wood farming. Of this there is little known here. German forestry results, so often referred to and quoted, are obtained in a thickly-settled country, where every piece of wood, even the tree twigs, have a money value, and where labor is lightly paid. The net results so obtained have no present meaning here, and therefore it can be fairly said that Professor Fernow begins his experiment without other foundation than an opportunity, a scientific training, and a vast amount of stored information as to what to avoid. He can be relied upon to add a great deal to the sum of human knowledge.

A crossing commission at Springfield, Massachusetts, has had the courage to come out in plain language and tell the applicants for a separation of grade at Armory Street and the East Hartford branch of the New Haven road (formerly the New England) that the proposed change will be too costly, and that the only practicable remedy for the dangers at the crossings (there are more than one) will be to reduce the speed of the trains, and, if necessary for safety, to have every train stop before going over the crossing. Under the admirable Massachusetts law of 1891, the abolition of grade crossings is begun, in each case, by the appointment of a special commission by the Superior Court, to decide what shall be done. The court generally puts one or more engineers on each commission, and in every way aims to secure an intelligent and wise decision. In most cases, however, the town and the railroad come to an agreement on essentials before the court is applied to, and the Commissioners have to deal mostly with details; but at Springfield it appears that the citizens insisted on bridges where the cost would be prohibitive (though not unusually heavy). The case is worthy of note, chiefly as a reminder that the "grade crossing problem" is not always to be easily settled, even when the state gives the towns a big lift, as is the case in Massachusetts; and most certainly not when the lift is a very faint one, as it is in New York state. The Armory street case can be settled quite easily as compared with many similar ones. The branch in question comes into Springfield from the southeast and passes through a residence portion of the city before it reaches its terminus at the Union station. The crossings are two or three miles from the terminus. Passengers for Springfield proper can disembark at Armory street station (before crossing) and go to the business portion of the city by an easy street car ride, and the two passenger trains each way daily can stop at the crossings between Armory station and the terminus. This will be an annoying waste of time, but even so the journey to or from the Union station can be more quickly made than by street cars; and as the road will probably have to be kept open for freight, the cost of the extra mileage run by the passenger trains (as compared with changing the terminus to Armory street) will be exceedingly small. The Commissioners recommend that freight trains be run during the night. This problem was somewhat unusual, as it dealt with a road doing a very poor traffic, yet located in a thickly settled town. Busy roads in busy towns can solve their problems, because both railroad and town can afford to make some expenditure. Thin roads in thin country are also all right, because there it is well understood that, trains being few and wayfarers also few, the only way is for everybody to "look out for the engine." A third class, large roads in a thin country, must furnish flagmen, however small the number of people using the crossing, for does not a large business produce large wealth? Every farmer is dead sure on that point. In the case of the fourth class, that which we have been considering, the railroad must sooner or later surrender, and reduce the speed of trains to any limit demanded.

The Coroner's jury in the case of the men killed on the track in a tunnel at Gallitzin, Pa., on Sunday afternoon, Jan. 29, finds "no blame attached to any one." So far as we can judge from the details published, this is, no doubt, legally correct, and the law which makes track laborers responsible for their own safety in cases like that is, very likely, the most equitable provision that could be made; and yet this was a peculiarly deplorable accident. It will be recalled that a gang of men was working on the north track, near the west end of the tunnel, and that they were struck by a train of four empty engines, which came from the east on the south track. The men expected the train on the north track, and stepped off that track, only to be knocked over by the dozen, almost. Two were killed outright. The first remedy that suggests itself to every one is the rule requiring men in such cases to step into the ditch instead of upon the other track. Tunnels generally have places of refuge sufficient for all needs. But then the question arises, how shall this rule be enforced? For the real desideratum is not merely to get a rule which will clear the employer's skirts, but to avoid killing men. In this case the men, being near the western mouth of the tunnel, undoubtedly felt safe in depending upon their eyes to warn them against eastbound trains, while for westbound they had to depend upon their ears. Where men feel sure that they will be able to see approaching trains in season, they do not like to go into the ditch, even if it be dry. The jury recommended that gongs be placed at the entrances to tunnels, to be sounded by the tower men when trains enter the opposite ends; but that would generally be of no value to men in the middle; and to arrange a code of bell signals which would fit all emergencies would be impossible. It would be inadequate just when it was most wanted. Running trains on "the wrong track" is dangerous enough in broad daylight, for a considerable percentage of the people who walk on tracks seem to be very fond of taking risks; but in the darkness of a tunnel the only safe rule would seem to be to have a very good headlight and reduce speed to a very low rate. Otherwise, the workmen, if they cannot be made to clear both tracks, should always be protected by flags both ways. And even flagging would probably fail, four times out of five, in circumstances like those attending this case. Another distressing case, not far from Gallitzin, was the killing of three boys and a girl in the same way, near Irwin, Pa., Jan. 10. The young people had been skating, were walking on the eastbound track, on a sharp curve, and were struck by a westbound fast train. The engineman sounded the whistle, but he was running very fast. In this case the victims had, of course, not the least shadow of right to walk on the track; still, every railroad officer, as well as everyone else, wishes to prevent such accidents. We have no new remedy to suggest, for the arrest and punishment of track walkers seems to be the only feasible remedy. But is it not proper to suggest that municipal officers have a duty in this matter? Why should the railroad company be put to the expense of keeping people from using the tracks as a pedestrians' highway?

Speaking of municipal officers and their duties, we would call the attention of such to the following note from the Philadelphia Public Ledger:

Outrages by tramps who steal rides on railroad trains are becoming alarmingly frequent. These vagabonds, who respect no law but that of force, seldom scruple to attack the crews of trains on which they find themselves superior in numbers, and stories of desperate encounters in which they have wounded and even killed the men who tried to put them off are

unpleasantly abundant. The freight train man's life is a hard one at best, his chance of being killed or injured in the routine of his duty is higher than in almost any other calling, and if, in addition to all this, he is required to risk his life in frequent encounters with an overwhelming force of desperadoes, his condition becomes desperate, indeed. It is difficult to suggest a remedy for the evil; legislation alone will not keep tramps off of freight trains, nor make them behave themselves while on them; neither the State nor the railroad companies can, apparently, devise an effectual means of discipline for them, and yet something must be done, or the State must confess that it is unable to deal with the worst class of criminals among its citizens—which is not a comfortable confession to make in this community and at this stage of the world's progress.

It is not so very difficult to suggest a remedy; the difficulty is to apply it. It is agreed that the best way to repress tramps, or thugs, or housebreakers, or counterfeiters, is to keep under constant surveillance—or as near constant as practicable—every individual belonging to those classes. This seems like an almost impossible task in country districts, but no one has yet suggested any better method. It is the method successfully pursued in those large cities where lawbreakers have their headquarters. And, if we mistake not, a beginning has been made in a region largely rural—the territory traversed by the Pennsylvania lines west of Pittsburgh. The very interesting police work on that railroad was described in The Railroad Gazette, Oct. 14 last, p. 739.

Mr. Charlton, of the Chicago & Alton, once advertised his road by publishing an alleged letter from a tramp—an honest tramp who was too high minded to ride on the "blind baggage" and therefore walked. He testified that the Alton was the "rockiest" road he had ever found; which was held to prove that the Alton was stone-ballasted. Now the Burlington betrays confidence by printing a private letter from a man in the Montana state prison, who says: "I am in the Montana state prison, serving a long term. I have no friends, nor any money, so am very lonely in my prison cell. Will you please send me a hanger of the United States; I believe you call it the commercial map of the United States? If you will, I can pass a good many months looking it over. . . ." Why he prefers a Burlington map is, perhaps, too delicate a question to be discussed in this place; but we venture to suggest that it is because he is lazy, and thinks straight lines will be easier to study. If he really wants material for a ten years' study he ought to ask Mr. Eustis for a map of some crooked and hilly road—that is, a map of some other fellow's lines.

The Baltimore & Ohio has introduced on two of its routes a second class sleeping car for first class passengers. This is an interesting variation on the ordinary "tourist" sleeper, which thus far has not proved very popular east of Chicago. Whether this lack of popularity is due to the indifference of the traveling public or to the strenuous efforts of the general passenger agents to avoid introducing a rate disturbing element is a question on which perhaps all are not agreed. The Baltimore & Ohio, however, does not use the term "second class," nor does it call the cars "tourist." The announcement of the new arrangement simply says that an "ordinary sleeper" will be run in addition to the regular first class sleeper. One ordinary sleeper runs from Chicago to Pittsburgh and one from Pittsburgh to Chicago nightly, and there is a similar service each way between Baltimore, Md., and Newark, O. The rates are to be one-half the ordinary Pullman rates.

The Snowstorm.

The entire Atlantic Coast, from New England to Florida, was visited the first three days of this week by the severest snowstorm which has been experienced in these states for eleven years; and in some respects the present storm is worse than the "blizzard" of March 12-13, 1888. In the vicinity of New York the snow began falling Saturday night and continued, with occasional slight abatement, until Tuesday morning, when the depth was 18 to 24 in., with drifts everywhere. The railroads all fared alike, and it would be useless repetition to give the particulars of the delays to trains. In New York City Monday was observed to a considerable extent as a holiday, which made traffic considerably lighter than usual, and on the following day, Tuesday, the snow was so deep everywhere that many suburban passengers made no attempt to reach the city. This, with the small volume of miscellaneous traffic, due partly to the extremely low temperature, made the blockades at the passenger stations less annoying than they usually are in the case of a snowstorm. Passenger trains were kept running, though with great difficulty, until about Monday noon; by night nearly all had been abandoned, and before midnight all of the railroads had decided that they would be unable to move passengers with any certainty before the middle of Tuesday forenoon. This general statement is true of the New York, New Haven & Hartford, the New York Central and the Pennsylvania, and so far as we can gather from the daily papers, of every road in this territory. The Delaware, Lackawanna & Western appears to have had less trouble in getting its trains to New York Tuesday morning than most of the other roads. The storm was equally severe at Boston, Albany, Philadelphia and Washington, and through trains were delayed from 20 to 30 hours. The main line of the Pennsylvania through to Altoona appears to have been blocked for from 12 to 36 hours. At Washington the snow was 2 ft. deep, and in a large section of Northern Virginia it was reported as 27 inches deep. Navigation in New York Harbor and Long Island Sound was much impeded by ice. The Sound steamers omitted their trips for several nights. On Monday and Tuesday ferry boats in the East River were unable to make more than a small fraction of their regular trips.

This snowstorm was preceded by very unusually low temperature for four or five days. At New Orleans the mercury on Monday stood at 6.8° above zero, considerably lower than was ever before recorded in that city. In Florida the temperature was below the freezing point and orange trees were much damaged. Throughout Texas the cold was very severe and vast quantities of early vegetables were damaged. Crops were greatly damaged all along the South Atlantic Coast, though a telegram from Augusta, Ga., says that the peach crop in that region is safe. At Fayetteville, Ark., the temperature on Sunday morning was 24° below zero, 15° colder than had ever before been known. In Texas there was much snow and the railroads had great difficulty with both snow and ice.

A severe snow blockade prevailed in Colorado for 16 days, ending Feb. 9. At Leadville the stock of coal ran so low that hundreds of men from mines and other industries had to take hold and help shovel out the tracks of the railroad in order to avoid a coal famine.

In the Eastern states a gratifying feature of the blockade was the absence of damage to telegraph wires, due to the dryness of the snow.

The effect of the storm on the working of the street railroads in many of the large cities is, of course, pretty well known. In Manhattan (New York), the horse, cable and conduit electric lines all suffered and only the cable roads kept up a fairly good service. Most of the cross-town horse car lines were blocked on Monday, and by Tuesday all were at a standstill. The cable lines kept up a fairly regular service through the storm, the principal delays being due to wagons getting on the tracks in front of the cars, and these delays were greater after the storm when wagon traffic was fully resumed, than while snow was falling. During the worst of the storm comparatively few cars were run, as but few people desired to ride.

The stoppage of the conduit electric cars, it was explained by the officials of the Metropolitan Street Railway Company, was not the fault of the power by which the cars are run, but was due to the wind and the fineness of the snow. Sixty-one sweepers were in operation on the different conduit electric roads in Manhattan, but they were unable to keep any of the lines open for traffic while the wind lasted. Another difficulty that the company had to contend with was the exhausted condition of its men. The men worked continuously with the sweepers and plows for over 48 hours, and, despite frequent relays, many had to give up on Monday evening.

The electric roads in Brooklyn kept the streets pretty well cleared during the worst of the storm, but this was accomplished only by persistent efforts of a force of experienced officers and men.

Nearly all of the electric roads on Staten and Long islands made no attempt to run after Monday noon and a similar condition existed on the roads in the vicinity of New York, and in fact to a large extent in all regions affected by the storm.

Combustion and Calorimeters.*

By H. J. Williams.

When coal is properly burned on the grate, practically the only resulting volatile products should be carbonic acid gas, water vapor and nitrogen. The air of the draught furnishes one volume of oxygen and four volumes of nitrogen. The nitrogen plays no part whatever in the combustion, but, together with the carbonic acid set free, hinders it, by forming a sort of blanket which prevents the whole of the oxygen present from combining with the burning fuel. To insure perfect combustion it is, therefore, necessary to have present a moderate excess of air over and above the quantity theoretically required. When the draught is properly adjusted to meet these requirements the fire burns briskly and a considerable amount of carbonic acid is found present in the flue gases. Any escape of hydrocarbons or of carbonic oxide in the flue gases means insufficient draught, incomplete combustion and loss of heat; on the other hand, any excess of air, over and above the amount theoretically required, also means just so much reduction in the temperature of the furnace and decreased efficiency. The excess of air admitted should, therefore, be cut down to the smallest amount that will insure perfect combustion, as shown by the absence of carbonic oxide and hydrocarbons from the flue gases, and yet sufficient in quantity to keep up a brisk fire, as shown by the requisite amount of carbonic acid therein.

The best conditions for each furnace can only be determined by experiment, but we can do to-day what was impossible a few years ago, for, by means of carefully conducted analyses of the flue gases, we can now regulate, to a nicety, the excess of air which should be admitted in order to secure the right conditions for economical combustion. In my opinion, from 10 to 15 per cent. excess air is quite sufficient to secure the best results with stationary boilers, provided that the firing is properly performed, while, under no circumstances, should the excess exceed 25 per cent. There are very few reliable analyses of the flue gases escaping from locomotives, but such as exist indicate that the excess of air, under favorable conditions, is fully 100 per cent., which is much more than is necessary for perfect combustion. A forced draught that will sometimes carry away large pieces of coal through the stack must necessarily cause a large excess of air and decreased efficiency.

As the quality of the fuels used greatly influences the economy and efficiency of the boilers and engines employed in the production of power, the exact determination of their heating or calorific power becomes a matter of vital importance. Its value is unfortunately much diminished when its determination is intrusted to persons that are insufficiently trained to do the work properly, or who employ calorimeters that are inaccurate and whose results are grossly misleading. The calorific power may, to be sure, be calculated approximately from the results of an accurate ultimate analysis of the coal, by the use of Dulong's formula, but the formula itself is unreliable for all coals, so that the results thus obtained are also far from the truth. A really good calorimeter, on the other hand, shows the actual calorific power, whatever the nature or the quality of the coal.

These instruments group themselves in three classes:

1. Those in which the fuel derives its oxygen from salts, from which it must be set free.
2. Those in which the combustion takes place in a stream of oxygen, introduced from the outside.
3. Those in which the combustion takes place in an atmosphere of oxygen under pressure, and in a confined space.

The first class is represented by the Lewis Thompson calorimeter, which has been widely used in England and is, unfortunately, still used in this country. To operate it, three grammes of coal are intimately mixed with one part potassium nitrate and three parts potassium chlorate, the mixture being transferred to a copper tube, closed at one end, which is then set in a copper socket provided with springs. A small fuse is inserted, which is then lighted, and a cylindrical copper chamber, provided with a tubular outlet, is slipped over the combustion tube, being secured to the socket by a bayonet catch. The combustion chamber is then immersed under two liters of water, contained in a copper calorimeter-can, and the initial temperature of the water is taken. Combustion takes place, the gases escape from below and bubble up through the water, by which they are cooled, and, after the combustion has ceased, the rise of temperature of the water is noted. This instrument is worthless for the purpose intended, as its action is accompanied by a mass of errors of variable magnitude, which cannot be reckoned with, as they are rarely, if ever, twice the same. Most of these errors are of large size and they do not balance each other. A few of these, but by no means all, are: First, the oxidation of the copper cylinder; second, the incomplete or the too rapid combustion of the fuel; third, the imperfect cooling of the escaping products of combustion; fourth, the loss of heat due to the energy expended in setting the oxygen free from its salts; fifth, the variable influences due to the solution of the residual salts and products of combustion in water, leading in some cases to increase, in others to decrease of heat, varying in amount with the different fuels; sixth, the absolute lack of protection of the apparatus from the variable influences of the surroundings, which no method so far suggested adequately remedies. In short, the apparatus is altogether too crude for an operation requiring great exactitude, for even where great care is taken and the results have been corrected, after a fashion, for attendant influences, they appear to be from 3 to over 10 per cent. lower than the theory. Moreover, the occasional close agreement of the results with the theoretical is by no means due to the heat developed by the fuel, but by attendant influences of which absolutely no account has been taken. A British authority, who realizes that there is something amiss with this apparatus, seriously recommends in all cases the addition of 15 per cent. to the results actually obtained, a practice which needs no comment. Owing to the low results which it yields, this calorimeter is highly recommended by persons who have boilers to sell, who enthusiastically point to the high efficiencies realized with their boilers, when based upon the results obtained in the "Thompson" (?) calorimeter.

The William Thompson calorimeter is an instrument which represents the second class. It is open to many of the same objections as the preceding. Its general form is about the same, but the vessels are made of glass and the combustion is carried on in a platinum crucible.

Some of its defects are: First, lack of protection from the surroundings; second, the too rapid or incomplete combustion of the fuel, the errors of which are only made more uncertain by admixtures of the coal with other coals of different nature; third, the frequent escape of imperfectly burned or insufficiently cooled gases from the water; fourth, the occasional scattering and loss of portions of the charge by the inflowing stream of oxygen; fifth, the introduction into the apparatus of a variable amount of oxygen gas, of uncertain temperature; sixth, the important error due to the solution of the products of combustion in the water used. High claims have been made for the accuracy of this instrument, the use of which has, very recently, been recommended for boiler practice, but they do not seem to the writer to be justified, for the very good reason that the apparent coincidence of the results with the theoretical figures is largely due to the rise of temperature which takes place when the escaping carbonic acid gas partially dissolves in the water of the calorimeter. The heat thus developed is in no way connected with the combustion, and should be deducted, while the error thus introduced is of large size and varies with the temperature of the water and the rate of combustion, so that no exact correction can be applied. This source of error does not appear to have yet been thought of, but it exists, nevertheless, and certainly vitiates the accuracy of all the results hitherto obtained with this instrument.

The only calorimeters that can lay the least claim

*Extracts from a paper presented at the December meeting of the New England Railroad Club.

to accuracy are to be found in the third class, which is represented by the "bomb calorimeters." The first of these was originated by Messrs. Berthelot and Vielle, but it was an instrument of very small capacity. It was subsequently modified, for technical purposes, by Mahler, Hempel, Donkin and others. Hempel's bomb has no internal lining and corrodes badly, while its construction is defective. It is closed by a large screw-plug, which soon becomes loose, owing to the spreading of the neck of the bomb, so that it soon becomes impossible to confine the gases therein.

Mahler's apparatus, which appeared in 1893, has been, until now, the most accurate and satisfactory calorimeter devised. The bomb consists of a shell of forged steel, whose exterior surface is nickel-plated, while its interior is protected from corrosion by a thin lining of enamel. The coal is placed in a small platinum pan, which is suspended from the cover of the bomb, and it is ignited by a fine iron wire, in contact with the coal, which is kindled by electricity. A heavy cover screws upon the outside of the neck of the bomb, and the bomb can then be charged with about 25 atmospherese of oxygen, which is introduced through a projecting stem and pin-valve, operated by means of a thumbscrew. The bomb is immersed in exactly 2.2 liters of water, which is stirred by a spiral agitator, operated by hand. The combustion is immediate and complete, and the heat generated is transferred to the water of the calorimeter, where it is accurately measured. The apparatus is suitably protected from the surroundings, and very nearly all the sources of error existing in the other forms of calorimeters are done away with. Accurate as this instrument is, there are several sources of error which have been overlooked, and several annoying defects of construction which are serious; but aside from these the errors are, for the most part, small. The defects of the apparatus are mostly the following: First, the enamel lining is a poor conductor of heat, and not only causes a trifling error, but it soon peels off, owing to the unequal expansion, between metal and enamel, to which the apparatus is subjected. After about 20 combustions, imperceptible cracks occur, corrosion sets in and the lining ceases to prevent the gradually increasing errors due to this corrosion. Second, the cover, which is very heavy, screws upon the exterior of the neck of the bomb, and depends for a tight joint, upon the sliding contact of an annular tongue upon its under surface, which fits into a corresponding slot in the neck of the bomb, which is provided with a ring-washer of lead. This method of closing is awkward, requires great effort to make it effective and does not invariably yield a tight joint. Third, the bomb is never entirely immersed in the water, as a portion of its stem projects above the liquid. Losses of heat, by conduction and radiation, occur through this defect, and they cannot be corrected, because they vary at an irregular rate with every coal burned. Finally, the calorimeter-can is open to the air, and the stirring of the water is both awkward and tedious, requiring, as it does, the almost undivided attention of one operator. There are other minor sources of error, which need not be mentioned here, but inasmuch as the range of temperature measured does not greatly exceed three degrees, the minute accidental errors in the readings, which are liable to occur, seem capable of being much reduced.

The improved form of bomb calorimeter which the writer has constructed remedies practically all the defects to which attention has been called, while all operations which can be performed mechanically have been intrusted to the electric current. The bomb itself is made of aluminum bronze, which transmits heat much more rapidly than steel. It is spherical in form, with the exception of a short neck, through which it can be charged. The spherical form secures the maximum strength and capacity attainable with a minimum weight and bulk of metal, so that the bomb requires less water to cover it and responds quickly to very slight changes of temperature. It is closed by a lid, which is pressed directly downward, by means of a nut, which screws into the neck of the bomb and which slides upon a restricted area of the lubricated upper convex surface of the lid. The outer circumference of this lid is thus brought into crushing contact with a ring-washer of tin resting upon a shoulder within the neck of the bomb. All twisting of the lid is thus avoided and an absolutely tight joint is invariably secured, with very little effort. A special form of check-valve takes the place of the projecting stem and pin-valve, already described, and makes it possible to completely submerge the bomb, so that not a trace of heat developed within it can escape measurement. The calorimeter-can is provided with a side chamber, which receives the electric stirrer, and a cover, which effectually prevents the trifling loss of heat due to the evaporation of liquid from the calorimeter. The special form of the bomb and of the calorimeter-can makes it possible to completely cover the bomb with as little as 1.5 liters of water, which is nearly 32 per cent. less water than is required for the Mahler bomb, even though the latter is not completely submerged, so that the rise of temperature obtained on burning any given amount of fuel extends over a greater range, while the small but unavoidable errors in the readings are greatly reduced. The outside of the bomb is nickel-plated, while its interior walls are very heavily coated with gold, which protects it perfectly from corrosion and which transmits heat much more quickly and perfectly than enamel. Finally, the water jacket which surrounds the calorimeter has a heavy covering of felt, while a second cover rests upon the top of this felt covering and effectually protects the calorimeter-can from the variable influences of the atmosphere. This last protection is so effective that, if the temperatures of the water contained in the jacket and in the calorimeter-can, respectively, have been properly adjusted, the temperature of the water in the calorimeter-can, after the maximum has been recorded, will not vary one one-hundredth of a degree during the seven or more minutes through which it is necessary to take observations, after combustion, in order to measure the influence of the surroundings and, if need be, apply the necessary correction therefor. Finally, special provision is made for withdrawing the products of combustion from the bomb and proving, by the analysis of the gases, that the combustion is complete, while other features, such as the special form of the platinum crucible-stand, which receives the charge, and the automatic method employed in setting fire to the coal, greatly facilitate the manipulation of the apparatus, and secure greater lightness, sensitiveness and accuracy.

In conclusion, it may be said that there is a growing appreciation among engineers and manufacturers of the importance of knowing accurately what they are doing. In the purchase of coal, for instance, where it is impossible to judge of the quality of the article by its appearance or by its price, determinations of its exact calorific power should prove of the greatest economical value. The day is not far distant when the price paid for coal will be set by the number of heat units which are obtainable therefrom, as this is the only safe and rational system to follow in the purchase of large quantities of coal. Furthermore, while the determination of the calorific power of any coal does not indicate how it will behave when fired, the calorimeter test and the analysis of the coal combined, when properly interpreted, not only disclose its true heating power and commercial value, but also indicate fully the manner in which it will behave on the grate.

Disinfecting Stock Cars.

In several European states, where contagious cattle diseases are feared, the disinfection of stock cars is prescribed. Various methods have been followed. In the Austrian Railroad Club, recently, Mr. Freund read a paper on the subject, in which he said that a thorough mechanical cleansing is in all cases indispensable, and must precede chemical disinfection. The methods of disinfection prescribed in Austria, Hungary and Germany do not answer the requirements of the sanitary authorities, which are that the process shall destroy certain germs. But these germs, he said, survive after being kept several months in a 5 per cent. solution of carbolic acid, or after being exposed 12 minutes in a current of steam of a temperature of 212 degrees. Nor does the subjection of the cars to high-pressure steam or spraying them with a solution of formaldehyde answer the purpose.

Experiments with solutions of chloride of lime have proved to be really effective, and at the same time practicable. If the solution is filtered, its injurious effects on the cars will be rendered very slight. It can be used cold, requires no complicated or costly apparatus, can be applied by common laborers, and has no bad effect on the health of those using it. The odor of chlorine is soon dissipated, and by the use of antichlorine can be destroyed immediately. The cost of a 5 per cent. solution is not greater than that of the ineffective steam process commonly used in Austria, and cheaper than the carbolic acid process followed in Hungary and Germany, and much the cheapest of the really effective processes so far know... It is quickly effected and easily supervised.

The Boston Subway.

We have received the fourth annual report of the Boston Transit Commission, which brings the work of that Commission down to Aug. 15, 1898. This annual report, like those which have preceded it, gives official documents and brief statements of the progress and condition of the work, section by section, and the series of reports is very useful to any one who studies them from the standpoint of the operating officer or constructing engineer. Being, however, what they must necessarily be, progress reports on various sections and fragments of the work, they are not very convenient to use. Sometimes, doubtless, the history of this admirable job will be collated and put in convenient shape.

The estimated cost of the subway, made in 1894, before the work was begun, as publicly announced, was $5,000,000. The work is now completed and it is possible to tell very closely what it has cost, although not exactly. It is believed that the cost of the subway will be less than $4,250,000, exclusive of the cost of some alterations required by an act passed in 1897, these alterations to adapt the subway to the use of the elevated railroad. Up to the date of this report, $64,230 had been spent on this alteration account. Finally, we shall doubtless have the remarkable and gratifying example of a very complicated engineering work which has cost less than the original estimate.

The document comprises the report of the commissioners themselves and those of the Chief Engineer of the Commission and the Chief Engineer of the Charlestown bridge. During the year the 10 masonry piers, the main portions of the two abutments, eight spans of the steel superstructure and the greater part of the masonry and the foundations for the Charlestown approach of the Charlestown bridge were completed.

One appendix is on the strength of the roof of the subway. The material used here is open hearth steel, partly acid and partly basic. The fibre stresses allowed were 15,000 lbs. per sq. in. in girders and 16,000 lbs. in rolled shapes under the common and 12,000 and 13,000 lbs. under the streets, these being the bending stresses. The stresses in compression in posts are respectively 11,000 lbs. and 12,000 lbs. The steel for all plates and shapes had an ultimate strength of from 60,000 to 68,000 lbs. in tension, a minimum elongation of not less than 20 per cent. in eight in. and reduction of area of not less than 40 per cent. Phosphorous was limited to .06 in basic and .08 in acid steel and sulphur to .06. The carbon varied between .10 and .28.

Another appendix gives information concerning the equipment of the subway. The rails are the American Society section, 85 lbs. per yard, with rolled steel guard rails of special section, weighing 43 lbs. per yard, securely bolted to the running rail. Tie plates are used on each tie. The ties are oak or chestnut, treated with woodiline, and are laid in broken stone. The switches and frogs are of special design, the switches, thrown by levers, fastened in place by steel wedges.

The subway is lighted by electricity, incadescent lamps between the stations and incandescent and arc lamps at the stations. The pump chambers have been wired so that the motors for running the pumps can be run from either one of two different circuits. Water collecting in a reservoir on reaching a certain height raises a float connected with an automatic rheostat, which starts a motor direct-connected to a vertical submerged centrifugal pump. When the water has fallen to a certain height the float descends and stops the motor. If the first motor should not start, as the water raises a little higher it starts the reserve motor. If that should not start, the water continuing to rise would ring an alarm bell. Duplicate pumps are used at each chamber.

Only three sets of ventilating fans have yet been installed. One of 72 in. diameter is run through counter shafting by an electric motor, the current taken from the trolley circuit. Two of 30,000 cu. ft. capacity per minute each are being installed and two others of 37,000 cu. ft. capacity per minute. These are all to be worked in pairs, driven by electric motors from the trolley circuit.

TECHNICAL.

Manufacturing and Business.

Fitz-Hugh & Co., Monadnock Block, Chicago, are in the market for several miles of re-laying rails weighing between 25 and 35 lbs., and also a number of dump cars, logging cars and 10 to 15-ton locomotives, all for 36-in. gage roads. Second-hand material only is wanted.

The Hilles & Jones Co., Wilmington, Del., makers of machine tools for railroad shop service, has contracted for a new steel-frame machine shop, 80 x 150 ft. It will be equipped with a 40-ton four-motor traveling crane and all modern labor-saving appliances. The shop is to be used principally for erecting heavy tools.

Wendell & MacDuffie, Havemeyer Building, New York city, representing C. C. Jerome, of Chicago, inform us that Jerome packing has been specified for 15 engines, to be built for the Central of New Jersey by the Brooks Locomotive Works.

Nathaniel Roberts, M. Am. Soc. C. E., designing and consulting engineer, has moved his office from 120 Liberty St. to rooms 1430 and 1431 Bowling Green Building, 11 Broadway, New York.

We are advised by the American Wood Preserving Co., 1015 Filbert St., Philadelphia, that it has just received an order from a large Eastern railroad for a carload (2,500 gals.) of Woodiline, to be used in treating ties and timbers.

The steam gages for the 48 locomotives ordered by the Union Pacific from the Brooks Locomotive Works will be furnished by the Star Brass Co., Boston, Mass.

Boiler Inspection in Massachusetts.

The laws in Massachusetts relating to the inspection of boilers and the examination of engineers and firemen have been in force three years. There are now 10 boiler inspectors, who also take charge of the examinations of applicants for positions as engineers and firemen. In March the Legislature appropriated $2,500 for apparatus to facilitate the work of examination. The law requires the inspection of all boilers (except locomotive boilers) not insured by the two boiler inspection companies doing business in the state. It is the intention of the department to provide, if possible, for the yearly inspection of all boilers. The number of boilers insured by the State is much larger than was expected, and the number is increased by the addition of many boilers from those previously insured by the inspection companies, the owners preferring State inspection.

The following shows some of the work done by the State inspectors during 1898:

Number of applicants examined	5,655
Number of licenses issued	3,571
Boilers inspected	1,961
Defects found	6,631
Defects found dangerous	2,589
Boilers ordered repaired	1,133
Boilers condemned	43
Prosecutions for violations of law	1

Electricity for the Arlberg Tunnel.

The troubles due to the bad ventilation in the great Arlberg tunnel are such that it is now seriously contemplated to substitute electrical traction for steam locomotives, and three great electrical companies have united to submit a plan for its introduction.

Power Brakes for Street Cars.

The question of power brakes for electric railroads recently came up before the Board of Trade (British) inspectors on account of an accident on the Bradford Electric Railroad last fall. A heavily loaded car ran down a steep grade, killing a number of persons and injuring others. The report made by Major Cardew states that the cars were not run within the limit of speed prescribed by the Board of Trade, and that inexperienced men were in control of the car. Other causes are also given. The principal question considered, however, is relating to the brakes, which

the inspector considers sufficient, if wisely used. It appears from the report that the car was provided with both an electric and hand brake. The Board, however, recommends that a slipper brake be required on these cars, which is not be used as an emergency brake, but rather is to be continually in use. Further recommendation relates to the addition of two sandboxes on each platform, so that sand can be applied to both rails. These recommendations have particular interest, inasmuch as other roads in England have been troubled in a similar way to the Bradford line.

Electric Train Signal on the Norfolk & Southern.

The passenger trains of the Norfolk & Southern Railroad are being equipped with an electric apparatus for communicating between the engine and each car, there being a bell in the cab of the engine and one in each car. There is also a battery in each car. The coupling between the cars is protected by a water tight covering and it will separate without damage if the train should break in two. The apparatus is made by the Electric Train Signal Co. of Norfolk, Va., of which Mr. W. S. Greene is President and General Manager.

THE SCRAP HEAP.

Notes.

During the recent cold weather there has been frequent interruption to the street car service in Chicago. On Feb. 6 the North Clark St. cable line was stopped at 6:10 p. m. by the breaking of the wheel over which the cable runs in front of the Division St. power house. As the break occurred during the rush hours and when the temperature was about 15° below zero, and as the cable was not started again for about five hours, the accident caused much hardship and suffering.

The State Railroad Commissioner of Ohio, Mr. R. S. Kayler, has completed his report for the year ending June 30, 1898. The report states that 18 per cent. of all highway grade crossings in the State are now protected by gates, watchmen or bells; at 15 per cent. of the crossings electric lights are maintained. Three overhead bridges at street crossings were built in Ohio during the year. Sixteen per cent. of all crossings of one standard railroad with another now have interlocking signals. Twelve new interlocking machines were put up during the year.

A prominent Western road has rescinded an order recently issued to conductors requiring them to be in the cupola of the caboose while the train is in motion. Conductors are permitted to exercise their judgment as to what part of the train they shall ride on.

On the night of Feb. 8 the steamer P. D. Staggs was destroyed by fire on the Tennessee River, near Johnsonville, Tenn., and the second clerk and six roustabouts were drowned. The river was very high, and in going under the drawbridge at Johnsonville about midnight the boat ran against the bridge and the pilot house and smokestacks were knocked off. The boat then drifted helplessly down stream.

Mr. James Means, of Brockton, Mass., acting in behalf of himself and other business men of that city, has applied to the Legislature of Massachusetts for a charter for the Massachusetts Electric Freight Co. The applicants desire to own freight cars and motors with a view to carrying freight over electric street railroads at night. They complain at the high rates charged for carrying freight by the New York, New Haven & Hartford from Boston to Taunton and other places in southeastern Massachusetts, and to compete with that road seems to be their chief aim, though from the report of the hearing before the Legislative committee it would appear that their plans are yet somewhat indefinite.

The Chesapeake & Ohio Canal.

The Maryland Board of Public Works (the Governor, the Treasurer and the Controller), met on Feb. 7, according to announcement, to open the bids for the sale of the state's interest in the Chesapeake & Ohio Canal, but there was only one bid and that was rejected. This bid was put in by C. K. Lord, President of the Consolidation Coal Company, and was for $300,000. The bidder promised to keep the canal open as a waterway for 20 years. This coal company is said to be controlled by Baltimore & Ohio Railroad interests.

New Steamer for the Plant Line.

The Plant Line has let to the Cramp Ship & Engine Building Co. a contract to build a new passenger steamer, to be 400 ft. long and 50 ft. beam. The vessel will have twin propellers and a guaranteed speed of 18 knots.

New Boats for Pacific Mail.

The Pacific Mail Steamship Company has ordered two steamships to be built by the Newport News Shipbuilding and Dry Dock Company. Each is to cost $1,750,000, and is to be 550 ft. long, 63 ft. beam, and of 12,000 tons. The vessels are intended for the Pacific.

American Rails in Denmark.

Vice Consul Blom writes from Copenhagen, Jan. 9, 1899: "From conversations I have had recently with importers of rails, I am of the opinion that American manufactured rails can compete in quality and price with those hitherto imported into Denmark from Germany and Great Britain. The railroads in Denmark require rails weighing 45 and 75 pounds per yard, and they use spikes, bolts, and fish plates. The Danish State railroads are 1,752 kilometers (1,089 English miles) and the private railroads 642 kilometers (399 English miles) in length. Several new roads have been projected, and will be built in the near future. The locomotives are all imported from Germany, but I understand that it is contemplated to send some orders for American locomotives. Manufacturers should correspond with H. C. Petersen & Co., Industribyguing, Copenhagen.

The Englewood & Chicago Storage Battery Road.

The 1898 annual report of the Chicago Electric Traction Co., which operates the Englewood & Chicago storage battery road, shows an increase in receipts of 50 per cent. over 1897. An extension of the storage battery road from Blue Island to Harvey of six miles of single track will be built next spring, and also about 2 miles of extensions and connecting lines at the north end of the system. No addition to the power house equipment will be needed, but about ten new open cars with trucks arranged for storage batteries will be required. The report shows that receipts per car day were $16.82; expenses per car day, $14.61; receipts per car mile, 10 cents; expenses per car mile, 8.7 cents. The power house record shows a total of 1,227,228 k. w. hours and a total maintenance and operating cost per k. w. of $0.0097. The cost of maintenance and operation of the batteries was $4,624.82; number of car miles run, 609,767, so the battery expense per car mile was $0.00758, or less than 9 per cent. of the total cost of maintaining and operating the road. The average mileage for each car-battery of 72 cells is 23,000 miles. Only the positive plates need renewing when the limit is reached, as service shows that one set of negative plates will outlast three sets of positive plates. The cars run 22 miles on one charge with new batteries, but after the cells have been used a short time the battery is changed on the up and down trips, making the run 11 miles for one charge. Cars have made as high as 40 miles on one battery charge. Schedule speed, including stops, is 12 miles an hour, but the cars can make 30 miles an hour. The record shows 1.65 k. w. hours at the power house switchboard during January for each car mile of service, which is about the average for the year. The officers of the company are: President, Isaac L. Rice, New York; Vice-President, Samuel Shipley, Philadelphia; Treasurer, J. S. Bache, New York, and Secretary, E. R. Gilbert, Chicago.

Telegraph Rights-of-Way in Virginia.

The Postal Telegraph-Cable Company has lately secured a decision in the Virginia Court of Appeals establishing the right of a telegraph company to procure a condemnation of a right of way for the construction of its telegraph line along and upon railroad lands. Some time ago the Postal Company endeavored to procure the right of way by condemnation over a portion of the Norfolk & Western Railway for the construction of a telegraph line. The Western Union, proceeding in the name of the railroad company, made a determined fight against the Postal's operations, and finally procured a decision in the Court of Appeals of the state of Virginia, in which the law providing for such condemnation was construed to mean that the telegraph line might be built "alongside of and equi-distant from the railroad throughout all its parts, so that neither shall meet or touch; not in or upon the railroad strip."

In the case of the Postal Company against the Farmville & Powhatan Railroad, recently tried before the same Court, although not composed wholly of the same judges, the Court, in referring to the previous decision, said:

"We are wholly unable to perceive, if this be the true construction, why the Legislature found it necessary to say anything about the railroad. The right which a telegraph company is authorized to acquire would be a matter of indifference to railroad companies if the construction heretofore given by this Court were correct, and the mention of them in the statute would be utterly irrelevant; but railroads are mentioned in the statute, and it is to be presumed for a necessary purpose, and we must find and give effect to the legislative intent by considering, not a part but all of the language used, and are justified in rejecting any part of the statute as unnecessary and irrelevant only in the last resort, when it has been found impossible to give effect to all the language used and reach a rational conclusion. It is impossible to read the three sections under consideration without at once concluding that the regulation of the rights of telegraph companies in their relation to railroad companies in the matter of the construction, maintenance and operation of their lines was one of the essential objects of the original statute and the sections into which it has been divided as they now appear in the code. 'Parallel to,' as used in section 1,287, does not have its primary and scientific meaning 'as lines extended in the same direction and in all parts equally distant.' That definition can in no case be applied to a line of railway, for no railway line is, we believe, mathematically straight. The Legislature merely intended to say that the telegraph line should be 'along and parallel to' in the sense of 'conforming to,' 'having the same direction of, tendency with' the railroad, in order to guard against any undue interference with or hindrance of the railroad company in the enjoyment of its property. If there were any doubt left as to the proper construction of section 1,287, the two succeeding sections should remove it. Sec. 1,288 provides that a telegraph company 'may contract with any person or corporation, the owner of lands, or of any interest, franchise or easement therein or in respect thereto, over which such line is proposed to be constructed,' for the right of way for erecting its line; and section 1,289 provides that if a telegraph company and 'such owner' cannot agree, the company shall be entitled to such right of way upon making just compensation therefor to 'such owner.'

"We, therefore, reverse the judgment of the former Court, and direct judgment to be entered in conformity with the views herein expressed."

Late Trains in Italy.

The Italian Government has brought in a bill in the Chamber of Deputies to secure regularity in the movement of trains. It is stipulated that all delays in the arrival of trains, if not justified by accidents, etc., shall render the company liable to a fine. These fines will cover four classes of trains. For express passenger trains, which have an allowance of 20 minutes of delay, all delays in excess of that 20 minutes will be subject to fines of 500 francs, 700 francs and 1,000 francs, according to the length of the delay, 1,000 francs being the fine for everything over 40 minutes. For way trains, which have an allowance of 25 minutes, the fines will be 200 francs, 500 francs, 700 francs and 1,000 francs, and in this case the fine of 1,000 francs begins after a delay of 50 minutes. For mixed trains, which have an allowance of 45 minutes, the fines are 200 francs and 500 francs, the latter being for periods over one hour. For lines on which the longest journey is less than 50 kilometers the allowance of delay is diminished 25 per cent. We mention this matter as being suggestive to the Texas Railroad Commission. It will indicate to them a new field for regulation.

The Delaware River Front Improvements.

The Board of Surveys of the city of Philadelphia on Feb. 6 approved the plan for the revision of lines and grades of Delaware avenue, from Vine street to Fairmount avenue, in order to widen the avenue towards the eastward on the river side. The work between South and Vine streets is nearly completed. The plan contemplates the widening of the avenue between Vine street and Fairmount avenue to a uniform width of 150 ft. Below Vine street the width is 150 ft. at the narrowest point. In that section the east line of the avenue follows the bulkhead line established by the government. Above Vine street the east line is parallel with the present west line of the avenue, and is within the bulkhead line at every point.

Japan Railroad Notes.

The 85-mile section of the Hokuyetsu Railroad connecting Niigata and Naoyetsu, was opened for traffic on Dec. 27, the distance being covered in 5 hours 15 minutes.

Owing to lack of funds, due partly to a considerable rise in prices of materials and partly to underestimating the amount of work to be done, work has been suspended on the three principal lines now being built by the Japanese Government. These are the Central, Hokuriku and O-U. Although an additional sum has been included in this year's budget, the amount is still insufficient to carry on the work.

Chicago Notes.

Mayor Harrison has vetoed the 50-year franchise to the Illinois Telephone & Telegraph Co., and the veto was sustained.

The Joint Committee of the City Council has recommended permitting the overhead trolley on all lines in the city, but a minority report was also submitted, setting forth that proper consideration was not given the underground system.

An ordinance providing for automatic block signals for the elevated roads was introduced and referred to the Committee on Railroads.

Advertising on Freight Cars.

The Illinois Central has forbidden the attachment of advertising signs to its freight cars, "except notices relating directly to the business of the shipper by whom the car is loaded." Such notices must be printed on cloth, paper or cardboard, not exceeding in size 2 ft. sq., and attached with cleats or tacks. Paste or glue must not be used in applying them, and they must not be placed over car numbers, initials or other inscriptions. The signs which are permitted to be used must be removed by the agent on arrival of cars at destination.

Activity in the Cement Business.

There seems to be considerable activity in the cement mills of the East, particularly in Pennsylvania. Among other work, three large mills are being put up in Lehigh county in addition to the dozen mills now running. For years the deposits of argilaceous limestone rock along the hills extending from Northampton to Berks county remained untouched, but last year over 4,000,000 barrels were sent out—the larger part coming from this district. To compete with foreign cement the most approved labor saving machinery has been introduced. As a result of this activity the cement imports have been cut down about 30 per cent., and this reduction will probably be still greater during the next year. The duty on imported cements is 8 cents a hundred pounds.

The Hamline Transfer.

The use of very large box cars for special freight transfer service at St. Paul by the Great Northern was noticed in the Railroad Gazette a few weeks ago. We learn from General Superintendent F. E. Ward that these cars are now in service and that, by using the transfer shed, the number of cars necessary to send out the package freight from St. Paul and Minneapolis to way stations on the road has been reduced about 50 per cent. The new transfer shed is at Hamline, between St. Paul and Minneapolis, and all L. C. L. freight from both cities is sent direct to the transfer, in the large cars, several times a day. The cars are 58 ft. long. Freight being sent out from the cities frequently, the average time between receipt of goods and delivery at destination has been shortened. The large cars are placed on the team tracks and freight is received into them directly from wagons without being run through the freight house.

Friction of Roller Bearings.

In some recent experiments on the comparative friction of roller bearings it was found that in a trial of two trucks loaded with 3,300 kilogrammes (7,260 lbs.) each, one having ordinary boxes and the other roller or ball bearings, the following differences appeared: In the truck with ball bearings the resistence per ton was 2.74 kg., while in the other it was 8.10 kg., or in the ratio of 1 to 2.9. The trucks were then loaded with five tons each to make the total weight 8,300 kg. The resistance was found to be for the first 2.51 kg., and for the second 8.74 kg. per ton, or in the ratio of 1 to 3.67. On increasing the load to 10 tons the resistance increased to 2.62 per ton, and 10.23 kg. per ton, the ratio of which is 1 to 3.9. The experiments were made by allowing the cars to roll down an inclined plane, and carefully noting the distance passed over before they came to rest and the difference of level of the two points, from which were calculated the resistance per ton and the effort of propulsion.

A Very Unreasonable Passenger.

Passengers will growl, even in Russia, where the newspapers relate the complaints of a traveler ticketed from Moscow to Kasan. He begins by growling at the slowness of the train, though it carried him at the rate of 13 miles an hour, and with the delays at stations he was only 72 hours in going 650 miles. Then he was landed on the shore of the Volga opposite Kasan, and made to get on board of an "ice-breaker" ferryboat, and to pay 10 cents, though his ticket read to Kasan. Moreover, the ferry landed

him on the ice more than a mile from Kasan, and the rest of the way he had to walk over loose boards, some of them on the ice and some of them floating, between ranks of peasants stationed there with boat hooks to fish out of the holes in the ice those who were unlucky enough to slip.

The French Railroads.

The six great French railroad companies, working together 20,658 miles of road, in the first half of 1898 earned, gross, $5,668 per mile, which was 3 1-3 per cent. more than in the first half of 1897. All of them had increased earnings carrying from 2 to 5 per cent. The state railroads, which are not included, are comparatively poor lines, their earnings per mile having been only $2,399 for the half year.

The Thrifty Conductor in Germany.

On the Berlin Elevated Railroad tickets are sold which are good for a journey to any of the next five stations. These tickets are punched by ticket takers at the station where the passenger gets on and taken up at the station where he gets off. Some of these ticket-takers have saved the tickets given up by passengers coming from stations less distant than the fifth station and when a passenger presented the ticket he had just brought to be punched, they have kept it and delivered him one of these other tickets, already punched. The unpunched tickets were sold over again by a confederate ticket-seller, and the proceeds divided So the art of "knocking down" seems not to be exclusively American.

The Russian Railroad to Afghanistan.

On the 16th of December last the first train passed over the new branch of the Trans-Caspian Railroad from Merv southward to Kushk, on the Afghanistan border, 80 miles from Herat. This branch is 196 miles long, and has a high strategical importance. Aside from this, it is on a route of considerable commercial value. The Trans-Caspian Railroad with this and its other branches is soon to be transferred from the War Office, which built it, to the Minister of Transportation, and thereafter is to be called the Central Asiatic Railroad.

Bribes in Personal Damage Suits.

At Chicago Feb. 4, the January Grand Jury reported to Judge Burke the results of its two weeks' investigation of the charges of bribery of jurors in the civil courts by bailiffs—the bribery alleged to have been in the interests of street railroad companies in suits for personal damages. Three indictments were returned, two against James J. Lynch for bribery, and one against John Dwyer for attempted bribery. Evidence of attempted bribery was found in eight cases in which the West Chicago Street Railway was concerned. The investigation is to be continued by the State's Attorney, and a number of bailiffs whose actions have been suspicious, but who could not be indicted, will be discharged. The following is an extract from the report: "The Grand Jury has investigated various charges of bribery of jurors and finds that bribery has existed for some time in the courts of Cook County to an alarming extent. . . . In one case before the Grand Jury wherein a jury was bribed, it appeared that the child plaintiff had lost her limbs and had become a helpless cripple for life. The great majority of the trial jury were in favor of awarding substantial damages because of the negligence of the defendant company in running a street car at an unreasonable rate of speed in a populous part of the city. A minority, two of whom at least were purchased for the benefit of the street car company defendant at a cost of $150, prevented a verdict in favor of the plaintiff, whereby she lost the only opportunity which she had of being compensated for the terrible injury which she had received. A failure of justice in such a case is anarchy, prostitution of the courts and robbery . . . The Grand Jury is satisfied that an organized system exists in the civil courts which has been for the benefit of street railroad companies."

Our Rulers.

Measures providing for the carriage of bicycles as baggage on the steam roads have been presented in the Massachusetts Legislature in usual abundance. They may embody a just demand, but there is an assumption of earth-ownership among bicycle organizations which is not agreeable to other people claiming the right to live. If our block pavement on Main street joggles the bicycle rider a little, forthwith a demand is served on the city to substitute vitrified brick—the cost to other people being unworthy of the wheelman's notice. If the street-car rail is not exactly suited to his convenience, the demand is instant and imperative that the rail must give way to another kind—or possibly be removed from the streets altogether. If bicycle paths on the country roads are wanted the public is asked to provide them. If riding on sidewalks is prohibited out of regard to the safety of pedestrians, a special paved way for wheels along the curbing has not been deemed too much to ask. And now the street car company is commanded to permit riders to carry disabled wheels on the cars, or the wheels of disabled riders. Our friends of the wheel need to cultivate a less pneumatic view of their own importance.—Springfield Republican.

Technical Schools.

University of Wisconsin.—The biennial report of the regents of the University for 1896-7 and 1897-8, contains, among other things, the report of the President, calling attention to what is being done at the College of Engineering and to its needs. From this it appears that during the last seven years the number in attendance has increased from 137 to 227. The increase has been uninterrupted with the exception of the year 1895-6. During the last year the attendance was greater than ever before. The attendance at the College of Engineering at this University has increased during the past five years 24.5 per cent. At Purdue the corresponding increase is 16 per cent., while during the same period there has been a slight decrease at Michigan and at Cornell. Mention is then made of the success of the graduates, the publications in this department, the courses of instruction and the material equipment. It is stated that provisions have been made for a dean of the college, and as noted elsewhere in this issue, Prof. J. B. Johnson has accepted the call to fill this place. Regarding the needs of the University, special attention is called to the crowded lecture rooms and the lack of floor space in the steam laboratory. The same condition exists in the rooms used for instruction in electrical engineering, where it is impossible to accommodate but a small section of the class at one time.

University of Illinois.—An adjourned meeting of the Board of Trustees of the University of Illinois was held in Chicago Jan. 13, six members beside Gov. Tanner being present. It was decided to ask the state Legislature for the following appropriations: For a new agricultural building, $150,000; for a woman's building, $80,000; for a new chemical laboratory, $135,000; for current expenses for two years, $140,000, and for a hygienical laboratory for the College of Physicians and Surgeons, Chicago, one of the departments of the University, $50,000. It was also decided to establish a summer school of nine weeks at the University, and $3,000 was set aside for that purpose. A committee of three was appointed to prepare resolutions on the death of Prof. J. B. Turner.

Technical Education in Germany.—On Dec. 8 last a conference was held at Hanover under the governmental sanction and direction to discuss German trade and manufacturing interests. As a result of the conference certain resolutions were passed recommending steps which should be taken to improve the technical education in Germany. Among other recommendations it is proposed to establish lecture courses in the city of Hanover, so that apprentices shall have an opportunity to complete their mechanical education. For these lectures a fee shall be expected from mechanics able to pay, but none shall be barred out from lack of means. It is also recommended that a permanent exposition of all power machines and tools used in the small trades be established in the same city. In connection with the machines sample products in process of manufacture as well as finished are to be shown.

Columbia University.—The trustees of the University have appointed Prof. William Ledyard Cathcart as Adjunct Professor of Mechanical Engineering, to take charge of the proposed course in naval engineering. Prof. Cathcart is now instructor in marine engineering and designing at Webb's Academy, and was recommended to the position at Columbia by Commodore Melville.

Purdue University.—Mr. Robert S. Miller has been appointed Assistant Professor in charge of the department of Machine Design, and Mr. L. V. Ludy has been made Assistant in the Engineering Laboratory, assuming the work which has hitherto been done by Mr. Miller. Mr. Miller is a graduate of the School of Electrical Engineering, class of '95, and received the degree of Mechanical Engineer from the same institution in '97. Since graduating he has been assistant in the Engineering Laboratory, and later instructor in Mechanical Engineering. In addition to his routine work at Purdue he had a leading part in the tests made two years ago at Purdue upon the balanced compound locomotive, and last year was in immediate charge of the fuel tests made at the University for the Cleveland, Cincinnati, Chicago & St. Louis, and still more recently assisted in the duty tests of the 20,000,000 gal. Snow pumping engine at Indianapolis.

Mr. George S. Morison, Past President Am. Soc. C E., delivered a lecture on masonry before the students of the Rensselaer Polytechnic Institute at Troy, N. Y., Feb. 8.

The Chicago Alumni of the Massachusetts Institute of Technology held its annual meeting and banquet Feb. 3, a feature of the meeting being connection by long-distance telephone with meetings held in Boston, St. Louis and Milwaukee. The following officers were elected for the ensuing year: President, I. W. Litchfield; Vice-President, F. L. Andrews; Secretary-Treasurer, E. M. Hager; Executive Committee, C. M. Wilkes, Solomon Sturges, L. D. Gardner.

LOCOMOTIVE BUILDING.

The St. Louis, Peoria & Northern is about to order the 25 locomotives noted in our issue of Jan. 14.

The Fort Worth & Rio Grande is having two locomotives built by the Baldwin Locomotive Works.

We are reliably, but not officially, informed that the Wabash is about to ask bids for building 30 locomotives.

We understand that the Missouri Pacific has finished the specifications for the 60 engines previously referred to.

The Brainerd & Northern Minnesota has ordered from the Richmond Locomotive & Machine Works the two engines noted last week.

The St. Louis & Northern Short Line (now building) will probably require a number of locomotives. (See Railroad Construction column.)

The Missouri, Kansas & Texas has asked bids for building 15 mogul engines to be duplicates of those ordered last summer from the Pittsburgh Locomotive & Car Works.

The Illinois Central has sent out specifications for building eight 10-wheel passenger locomotives with 19½ in. x 26 in. cylinders; 24 10-wheel freight engines with 20 in. x 28 in. cylinders; two consolidation engines with 23 in. x 30 in. cylinders, and six switchers with 19 in. x 26 in. cylinders; 40 engines in all.

The four 10-wheel locomotives which the Baldwin Locomotive Works is building for the Grand Rapids & Indiana are for delivery about April 1. The cylinders will be about 19 in. x 26 in.; diameter of drivers, 62 in.; working steam pressure, 200 lbs.; weight on drivers, 100,000 lbs.; and total weight, 135,000 lbs.

CAR BUILDING.

The Duluth & Iron Range has asked bids for building 400 ore cars.

The Marshall, Timpson & Sabine Pass, a road now building, will soon buy some rolling stock.

The Atlantic, Valdosta & Western has ordered 50 flat cars from the Georgia Car & Mfg. Co.

The Boston & Albany is considering buying 25 passenger cars. Reference to this proposed order was made in our issue of Jan. 31.

We are officially informed that there is nothing in the report that the Chicago Great Western will soon be in the market for 1,000 more cars.

The St. Louis & Northern Short Line (now building) will require both freight and passenger cars. (See Railroad Construction column.)

We understand that the Northern Pacific has ordered 200 more cars from the Michigan-Peninsular Car Co. and that the 200 ordered from the Wells & French Co., as stated last week, are to be Rodger ballast cars.

The 600 box and 200 flat cars for which the Minneapolis & St. Louis has asked bids, as noted in this column last week, will all be 60,000-lb. cars, but the date of delivery and details of the specifications have not yet been decided upon.

We are officially informed that the Florida Central & Peninsular is not in the market for new freight equipment. The 50 new flat cars ordered about six weeks ago are being delivered, but no other equipment is being ordered at this time.

We are officially informed that the Chicago Terminal Transfer will ask bids the first of next week for building 200 gondola and 10 box cars, all to be of 80,000 lbs. capacity, the contract to be let as soon as possible after bids have been received. Specifications are now being prepared.

In our last issue we stated that Murray, Dougal & Co. were building 10 cars for the Warren Refrigerator Co., and eight for the Pennsylvania Refrigerator Co. The companies ordering the cars are the Warren Refining Co. and the Penn Refining Co., instead of the names stated.

The 250 box cars being built by the Atchison, Topeka & Santa Fe at the Topeka shops will be 36 ft. long and of 80,000 lbs. capacity, for use in carrying grain. They will be equipped with Player brake beams, Player cast steel trucks, Trojan couplers, American draft rigging and Fort Madison wheels.

The 100 gondola and 100 flat cars to be built by the Ensign Manufacturing Co. for the Mexican International, as stated last week, are for March and April delivery, and will have Ensign iron axles, bolsters and brake adjusters; Carnegie deck beams, Westinghouse brakes, Janney couplers, Canda draft rigging, M. C. B. journal boxes, with Morris lids; French springs, diamond trucks and Ensign 33-in. wheels.

The 100 box and 50 gondola cars ordered by the San Antonio & Aransas Pass from the Ensign Manufacturing Co., and referred to last week, are for April and May delivery. They will be equipped with Ensign iron axles, bolsters and brake adjusters; Carnegie deck beams, Westinghouse brakes, Janney couplers, Canda draft rigging, M. C. B. journal boxes with Morris lids, French springs, diamond trucks and 33-in. wheels. The box cars will have Wagner doors and door fastenings, and Winslow roofs.

In our issue of Feb. 3, we stated that the Oregon Short Line had ordered 44 cars for passenger service from Pullman's Palace Car Co. and five from the Barney & Smith Car Co. We understand that of the 44 credited to Pullman's Palace Car Co. 37 are for the Union Pacific, five for the Oregon Short Line and five for the Oregon Railway & Navigation Co.; the five ordered from Barney & Smith are for the Oregon Short Line. The Union Pacific order calls for 15 chair, one dining and six baggage cars, and 15 coaches.

The order for 500 gondola cars for the Cleveland Terminal & Valley was let on Feb. 8 to the Michigan-Peninsular Car Co. and not to Pullman's Palace Car Co., as reported last week. These cars are for May 1 delivery, and will have a capacity of 60,000 lbs. and will weigh 26,000 lbs. They will be 36 ft. 10 in. long, 9 ft. wide, and 3 ft. 3½ in. high inside, and equipped with best open hearth steel axles; Schoen pressed steel trucks and bolsters; Sterlingworth brake beams; air brakes; U. S. Bronze Co.'s brasses; American continuous draft gear; McCord journal boxes and journal box lids; Standard freight car paint; spiral springs furnished by the A. French Spring Co., and cast iron wheels.

The Atlanta (Ga.) Railway will probably shortly be in the market for new cars for use on the lines now being extended. (See Electric Railroad Construction column.)

It is reported that the Chicago Electric Traction Co. (Englewood & Chicago Storage Battery road) will need 10 new open cars with trucks arranged for storage battery operation.

The Escanaba Electric Street Railway Co., of Escanaba, Mich., wants two motor cars, 40 ft. long, and five open and three closed trailer cars. A. R. Moore is President and Purchasing Agent. (See Electric Railroad Construction Column.)

BRIDGE BUILDING.

ALBANY, N. Y.—It is stated that the Delaware & Hudson Canal Co. has issued instructions not to repair present overhead bridges, but as soon as they could be condemned to replace them by new ones at grade.

Senator Brackett has introduced a bill which provides for the appropriation of $1,000 for repairs to the Division St. bridge; also $2,000 for building a swing bridge over the Chamberlain Canal.

BAKERSVILLE, N. C.—A petition has been introduced in the Legislature for a bridge across Ivy's Ford, Madison County.

BINGHAMTON, N. Y.—An election will be held March 2 to decide as to the building of the proposed Thompson St. bridge. (Feb. 3, p. 90.)

BOSTON, MASS.—Wm. Jackson, City Engineer, is advertising for proposals for building the abutments of the bridge on Swett St., over the N. Y., N. H. & H. RR. Plans are on file in his office. The proposals are wanted by Feb. 20.

BRADFORD, PA.—The City Engineer has submitted estimates for a steel bridge on Barbour St., and a resolution has been introduced in the Council to advertise for bids for its construction. The Engineer's estimate is $3,577.

CHESTER, PA.—The Street Committee has recommended that work be pushed on the Lloyd St. bridge, which is to cross the tracks of the Philadelphia, Wilmington & Baltimore. (Dec. 23, 1898, p. 921.)

CHILLICOTHE, O.—County Surveyor A. W. Jones has completed estimates for the caissons and other work for the bridge which is to be built over Main St. The caisson work is estimated to cost $21,000; the other work, $15,000.

CHICAGO, ILL.—Wm. Boldenweck, President of the Board of Trustees of the Sanitary District, is advertising for proposals for building the substructure and superstructure of the railroad bridge across the Chicago River near Taylor St. Bids are wanted by April 10. Plans and specifications are now available. Joseph F. Hass, Clerk. (Dec. 2, 1898, p. 866.)

CORNWALL, ONT.—The New York & Ottawa Ry. Co. have decided to rebuild part of the bridge which was recently destroyed.

DES MOINES, IA.—According to report, the city will expend $32,000 in building new bridges. A new bridge will be built across the Des Moines River at Sixth Ave.

DETROIT, MICH.—Only the location and general plans have been decided upon for the bridge which will be built over the Detroit River at Belle Isle. The plans must be approved by the Secretary of War. The location is between the buoy at the lower end of the Middle Ground Shoal and the south bend of Belle Isle. The proposed structure will be a high bridge, 117 ft. above the water, with a clear cantilever span of 1,300 ft. over the Canadian channel, and a total length of cantilever construction of about 2,400 ft. There is also a steel viaduct about 1,000 ft. in length, and three truss spans over the American channel about 335 ft. long each. (Dec. 16, p. 901; Feb. 3, p. 90.)

GLOVERSVILLE, N. Y.—A bill was recently introduced in the Legislature for a bridge across Long Lake in Hamilton County, beginning at a point on the eastern shore of the lake, opposite the northern end of Pine Island. The appropriation is $20,000.

GRAND RAPIDS, MICH.—A viaduct over the railroad tracks at Bartlette St. is said to be under consideration.

GREENSBURG, PA.—The Alleghany County Court has appointed County Engineer Chas. S. Davis, A. M. Breckenbridge and S. S. Waitneight as viewers for a site for the proposed new bridge across the Alleghany River from New Kensington.

GRETNA, LA.—The citizens of this place are agitating for a new bridge over the 17th St. Canal at Lake Ave. J. S. Brady is a member of the citizens' committee.

JOPLIN, MO.—Bids are wanted for a new bridge over Willow branch on Sixth St.

LIMA, N. Y.—A wooden bridge over the Auglaize River on Spencer road has been declared unsafe and a new bridge will probably be built. J. C. Cronley, County Engineer, Allen County.

LOUP, NEB.—Bids are wanted by March 14 for the building of all the wooden bridges required this year. John Minschull, County Clerk.

MAPLEWOOD, MO.—A new company about to be incorporated to build an electric railroad will probably require repairs to bridges on the proposed route. (See Electric Railroad Construction column.)

MINNEAPOLIS, MINN.—Petitions have been prepared for the widening of the Washington Ave. bridge, to cost $40,000.

NASHVILLE, TENN.—According to report, citizens of Perry County have formed an organization to secure the building of several bridges across Buffalo River. W. M. Leftwich, Jr., is City Engineer.

NEW ORLEANS, LA.—The Canal Board has taken steps to require the rebuilding of the Metairie Bridge across the Newbasin. A. C. Clark, City Clerk.

NORTHAMPTON, MASS.—E. I. Chapp, City Clerk, and Clerk to the Committee on Connecticut River bridge, informs us that the Northampton & Amherst St. Ry. Co. has petitioned the Legislature for permission to construct a bridge across the Connecticut River from Northampton to Hadley. He states that this request will probably be granted. The present bridge across this river is too light for electric railroad traction. It needs repairs to one pier and possibly to superstructure. The care of this bridge is in the hands of the Aldermanic Committee of Northampton. (Feb. 10, p. 106.)

OTTAWA, ONT.—The citizens of this place want a bridge over the canal at Somerset St. Alex. Lumsden, M. P. P., a member of the Retail Merchants' Association, has prepared a petition to the Legislature for this bridge.

PAINESVILLE, O.—The matter of a new bridge over the Grand River will be submitted to the voters at the spring election. B. F. Morse of Cleveland has begun soundings and will prepare the estimates for the bridge. (Feb. 10, p. 106.)

PORT ARTHUR, ONT.—(See Electric Railroad Construction column.)

READING, PA.—An ordinance has been introduced in the Select Council for an appropriation of $50,000 for a bridge to cross the P. & R. tracks at Spring St. It has been referred to the Highway Committee and the Board of Public Works.

ROCHESTER, N. Y.—A council committee has been appointed to look after the proposed new bridge. This consists of Supervisors Yates, Wm. Thomspon and others.

SANDUSKY, O.—The County Commissioners and officers of the Sandusky & Inter-Urban are considering plans for an overhead crossing of the Lake Shore & Michigan Southern on the Huron road.

SOMERVILLE, O.—Plans have been submitted by L. A. Dillon, Engineer of Hamilton County, for the truss bridge, 200x22 ft., over Sevenmill Creek, estimated to cost $15,800.

SPOKANE, WASH.—An old wooden bridge, known as the Spokane bridge, was recently washed away and plans are now being considered for a new structure of steel. B. H. Fowle, Secretary of Board of Public Works.

UTICA, N. Y.—There is talk of a new bridge over the canal at Washington St.

WATERVLIET, N. Y.—A new bridge is proposed over the canal near 23d St.

YONKERS, N. Y.—A bill has been introduced in the State Legislature by Senator W. J. Graney of Dobb's Ferry, authorizing the Westchester Board of Supervisors to investigate the Warburton Ave. extension, and secure the completion of the bridge for which money was appropriated about two years ago.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Canadian Pacific.—Preferred, semi-annual, 2 per cent., payable in April.

Chicago, Burlington & Quincy.—Quarterly, 1½ per cent., payable March 15.

Chicago, St. Paul, Minneapolis & Omaha.—Preferred, semi-annual, 3½ per cent., payable Feb. 20.

Cleveland & Pittsburgh.—Quarterly, 1¾ per cent., payable March 1.

Ft. Wayne & Jackson.—Preferred, 2¾ per cent., payable March 1.

Green Bay & Wisconsin.—One and a half per cent., payable Feb. 28.

Hartford & Connecticut Western.—One per cent., payable Feb. 28.

Iowa Central.—Preferred, 1½ per cent., payable March 1.

Mexican Northern.—Quarterly, 1 per cent., payable March 2.

Norfolk & Western.—Preferred, 2 per cent., payable March 1.

Citizens' Passenger Ry. (Norristown, Pa.).—Annual, $1.50 per share.

American Society of Civil Engineers.

A regular meeting was held at the Society House on Wednesday, Feb. 15, at 2.30 o'clock. A paper by Mr. E. L. Corthell, M. Am. Soc. C. E., entitled, "The Approaches and Transportation Facilities of the Paris Exposition of 1900," was presented and discussed.

Master Car Builders' Association.

The thirty-third annual convention of the Master Car Builders' Association will be held at Old Point Comfort, Va., commencing on June 14, 1899. Headquarters will be at the Hotel Chamberlain, which has made rates jointly with the Hygeia Hotel. Messrs. C. A. Schroyer, C. M. Mendenhall and W. S. Morris are members of the joint committee on arrangements for the Master Car Builders.

Western Society of Engineers.

At a meeting of the Western Society of Engineers, Wednesday evening, Feb. 15, Mr. Edwin Duryea, Jr., Resident Engineer of the New East River Bridge, Brooklyn, presented a paper entitled, "Excessive Precipitations of Rain at Chicago." The Committee on Papers has issued a notice to the members asking for papers to be read during the first half of the current year. Those wishing to present papers should notify the Secretary as soon as possible.

American Railway Master Mechanics' Association.

Mr. Jno. W. Cloud, Secretary, has issued an announcement that the Thirty-second Annual Convention will be held at Old Point Comfort, Va., commencing on Monday, June 19, 1899. Headquarters will be at the Hotel Chamberlain, which has made rates jointly with the Hygeia Hotel. Applications should be made to Alan F. Campbell, Manager, Hotel Chamberlain, or F. N. Pike, lessee, Hygeia Hotel. Messrs. Robert Quayle, J. H. McConnell and W. S. Morris are on the joint committee of arrangements.

Western Railway Club.

A meeting of the Western Railway Club will be held Tuesday afternoon, Feb. 21, at the Auditorium Hotel, Chicago. Short papers entitled, "The Uses of Compressed Air About Railroad Shops" will be presented by Messrs. J. W. Fitzgibbons, W. C. Squire and B. Haskell, describing the practice on the roads with which these gentlemen are connected, namely, the Chicago, Rock Island & Pacific, Atchison, Topeka & Santa Fe and the Chicago & West Michigan. These papers will be discussed as well as the following topics: "Should a Better Design for Flat Cars Be Used?" and "The Use of Water to Cool Hot Bearings on Cars and Locomotives."

Railway Signaling Club.

The annual meeting of the Railway Signaling Club will be held at the Lafayette Hotel, Philadelphia, Tuesday, Feb. 21, at 3 p. m. At this meeting officers will be elected for the ensuing year, and the following papers will be read: "Inspection and Repairs to Automatic Signals," W. A. D. Short, of the Cincinnati, New Orleans & Texas Pacific; "The Distant Signal," E. D. Wileman, of the Lake Shore & Michigan Southern; "Protection of Railroad Crossings," C. S. Rhoads, of the Cleveland, Cincinnati, Chicago & St. Louis. This meeting is held in the East so as to enable Eastern members to be present and take part in the discussion, and a large attendance is hoped for.

Railway and Telegraph Employees' Political League.

The first annual convention of this League was held at the Briggs House, Chicago, Feb. 6, and plans were discussed for strengthening the organization which has already, it is said, nearly 10,000 members. Arrangements were made for the mass meeting Feb. 18, which is to be addressed by the Hon. Chauncey M. Depew, as noted in this column Jan. 27 (p. 71). Mr. J. W. Callahan acted as temporary chairman. The following officers were elected: President, J. W. Callahan; First Vice-President, W. A. Mathis, Centralia, Ill.; Second Vice-President, J. E. Dayhoff, Chicago; Secretary, George Groobly, Chicago; Treasurer, D. W. Ross, Chicago. A Board of Directors of 31 was also elected.

The Engineers' Club of Philadelphia.

A regular meeting of the Club will be held on Saturday, Feb. 18, 1899, at 8 o'clock p. m. The subject of the paper will be "A Sand Filter Plant," illustrated, by J. W. Ledoux.

At the meeting of Feb. 4, Mr. P. J. A. Maignen presented the paper of the evening, "Water Purification for Philadelphia." After giving details of reservoir and pumping capacities and of water consumed, he described the features of the plan proposed for purifying the supply by filtering through sand, covered with asbestos fiber, roofed over and inclosed so as not to be interfered with by rain, snow and heat. On account of the value of land, it is proposed to erect the filters in two or more tiers in a filter-house beside each reservoir, and plans and elevations of drawings were reproduced by the electric lantern showing the arrangements suggested. The detail of the bacterial efficiency of sand filters was gone into at some length and the method of keeping the filters in good order was described.

Civil Engineers' Society of St. Paul.

A regular meeting of the Civil Engineers' Society of St. Paul was held Feb. 7 at 8 p. m.; present, 13 members and one visitor. A verbal report of Committee on Naval Personnel Bill was accepted and committee discharged.

Mr. Hogeland read a paper on "Locomotive Coaling Stations." He illustrated by drawings and photographs the evolution of coal handling for locomotive use on the Great Northern Railroad. Beginning with the primitive derrick and bucket system which was worked at an expense of 17 cts. per ton, he advanced through various stages: (1), shoveling into chute pockets; (2), dumping and chain conveying to chutes; (3), dumping directly into chute, coal car being raised by 15 h. p. gasoline engine. The Great Northern moves 750,000 tons annually through chute pockets of five or six tons' capacity at an average cost of 3 cts. per ton by measurement.

Mr. Truesdell folowed Mr. Hogeland with a description of improvements at the So. St. Paul Stock Yards, 172 acres in extent, bounded on the river side by 1¾ miles of levee. The level of the yards is several feet below high water mark, and has been flooded to the depth of 3 ft., but now the five sewer outlets may be closed by gates and pump wells have been provided in case of flood. Nine artesian wells supply water. Swift & Co.'s immense packing establishment and half a dozen minor concerns do a rushing business on the site. An electric lighting plant turns night into day when necessary.

Mr. Wilson, having in the meantime arranged a vast exhibit of asphalts, crude and refined, rock, plastic and semi-liquid, passed around prints and photos, and proceeded to say a few words on the sources of American asphalts. Trinidad, Bermudez, Kentucky, California and Utah deposits were considered, physically, chemically and geologically, but briefly, as the hour was late.

American Street Railway Association.

As indicated in our issue of Jan. 27 (p. 71), a meeting of the Executive Committee was held at the Auditorium Annex, Chicago, Feb. 6, to make arrangements for the Eighteenth Annual meeting to be held in Chicago next fall. The Committee meeting was attended by Messrs. C. S. Sergeant, President, Boston; W. H. Holmes, Third Vice-President, Kansas City; George A. Yuille, Chicago; T. J. Jones, Memphis; Ira A. McCormack, Brooklyn; John I. Beggs, Milwaukee, and T. C. Penington, Secretary, Chicago. The committee decided that the meeting will be held in Chicago Oct. 17-20 next, and received a report from Mr. Yuille, who was appointed a special committee on accommodations. In this report Mr. Yuille recommended that Tattersall's Building be secured, and after visiting the building and conferring with the owners, the Executive Committee adopted his report. In this building 50,000 sq. ft. of floor space is available for exhibition purposes, of which 90 per cent. is unobstructed by posts or partitions. Offices and committee rooms are available for headquarters and a meeting room for sessions of the convention can be partitioned off at small expense. The location of the building at Sixteenth and Dearborn Sts. is easily reached by several street car lines and is also favorable for the handling of freight. As it was thought the underwriters would object to the use of current from street railroad circuits, it was deemed best to ask the Chicago Edison Company to arrange to supply the necessary power. As it is expected that the exhibits will be fine, and in order to give delegates an opportunity to inspect them, no meeting will be held on Friday, Oct. 20, and no entertainment will be provided for that day by the local committee. It was also decided to hold the banquet and install the new officers on Friday evening. The following subjects were selected for discussion at the meetings, on which prominent members of the Association will be invited to prepare papers:

"Maintenance of Car Equipment."

"Modern Street-railway Shops; Their Design, Machinery and Shop-practice."

"Train Service and Its Practical Application."

"Construction and Maintenance of Street-railway Tracks."

"Investments in Street Railways; How Can They Be Made Secure and Remunerative?"

The report of the Committee on Rules for Employees will also be considered by the convention, this committee having been continued from the Boston meeting. Since that meeting the report has been completed and printed and copies have been distributed by Secretary Penington with the request that it be carefully studied with a view to its discussion at the coming meeting of the Association, when it will come up for adoption.

The Chicago street railroad companies were represented at the meetings and conferences of the Executive Committee. On Monday evening the Committee was entertained at dinner at the Union Club by the local companies. On Tuesday, after the business session, the Committee was taken on an inspection trip over the West Chicago St. Ry., and through various plants of the Yerkes systems, by Mr. J. M. Roach in his private car, luncheon being served during the trip. Local street railroad interests effected an organization immediately upon the announcement of the decision of the Executive Committee to hold the next meeting in Chicago, and Mr. G. A. Yuille, Second Vice-President and Assistant General Manager of the West Chicago St. Ry. was selected as chairman of the temporary organization. A meeting will soon be held to select members of local committees and to take up the work of preparing for the October meeting. Application for space has already been filed by Mr. Maurice Coster, Chicago representative of the Westinghouse Electric & Mfg. Co.

PERSONAL

(For other personal mention see Elections and Appointments.)

—Mr. John Lundie, formerly connected with the Illinois Central Chicago suburban lines, has been appointed Consulting Engineer for the Boston Elevated Railway Company.

—Mr. Thomas P. McDonough has been appointed Engineer of Track Elevation for the city of Chicago, succeeding Mr. Theodore Buskirk, resigned. Mr. McDonough held this position for several years previous to the recent appointment of Mr. Buskirk.

—Mr. Joseph R. Megrue, formerly Vice-President and General Manager of the Detroit & Lima Northern, was elected President of the Niagara Falls & Lewiston Railroad Company, or "Gorge Route," at the annual meeting Feb. 6. His office will be in Buffalo.

—Mr. Peter W. Neu, of Chicago, was instantly killed at Los Angeles, Cal., Feb. 4, by being thrown

from a tallyho coach by the breaking of the front axle. Mr. Neu was a member of the firm of Heldmaier & Neu, well-known stone contractors, of Chicago, and was in California in charge of the work of constructing the San Pedro harbor for the United States Government, for which his firm took the contract at about $1,500,000. Mr. Neu's firm has also done considerable work on the Chicago Drainage Canal. He was born in Germany 52 years ago.

—Mr. W. H. Harrison, Chief Engineer of the Uganda Railroad, in British East Africa, died recently from wounds inflicted by a lion. He and an associate, accompanied by a native, were hunting and started up a lion and lioness. Harrison shot and wounded the lion, which then charged him, seized him by his left arm and dragged him some distance, but seeing the negro, charged him; hereupon Harrison fired and wounded the beast a second time, which then returned and mangled Harrison fearfully. He was brought to camp and his arm amputated, but the shock and loss of blood were too much for him.

—W. S. Calhoun, General Eastern Agent of the American Steel Foundry Co., died suddenly at Macon, Ga., and will be buried in Chicago. Mr. Calhoun had represented a number of prominent railroad supply houses, his first position of importance being with the Chicago Tyre & Spring Co. His health failed some years ago, and after traveling for a time in an endeavor to recover, he became associated with the Brussels Tapestry Co. Mr. Calhoun was of a genial disposition, and had many warm friends among railroad officers and railroad supply men. During his connection with the American Steel Foundry Co. he had built up a fine business in the East.

—Mr. David S. Gray, a veteran officer of the Pennsylvania, celebrated his seventieth birthday and the fiftieth anniversary of his railroad service at his home in Columbus, O., on Feb. 8. He received congratulatory telegrams from his friends in many cities. For the past three years Mr. Gray has been the member for the Pennsylvania Railroad System of the Board of Managers of the Joint Traffic Association. He began his railroad service as a clerk on the Cleveland, Columbus & Cincinnati, and he was General Freight Agent on the Central Ohio Railroad and other lines in that region for several years; and in 1864 organized the operating department of the Star Union Line, the through fast freight line of the Pennsylvania system. In 1869 Mr. Gray was made Second Vice-President of the Pittsburgh, Cincinnati & St. Louis. For the next few years he filled various other positions in the Pennsylvania system, but from 1872 to 1896 his time was devoted chiefly to the Union line (for the last ten years as manager), though he was also General Agent of the Pennsylvania at Columbus.

—Mr. William E. Baker leaves the Metropolitan Elevated, of Chicago, to enter the service of the Manhattan Railway Company, of New York. This is another very strong indication that the work of electrifying the Manhattan system is not far distant, for Mr. Baker has for the last six years been especially identified with the electric operation of elevated railroads, and indeed he, more than any other man in the country, is the pioneer in this field. It was he who designed and installed the Intramural electric railroad at the World's Fair in Chicago. Then he designed the construction and equipment of the Metropolitan, which he has since operated as General Superintendent. He goes to the Manhattan as General Superintendent and Chief Electrical Engineer, taking immediate charge of the operating department.

Mr. Baker was born in Springfield, Mass., in 1857. He was graduated from Lafayette College, Easton, Pa., in 1877. He was employed for some years as a civil engineer on the engineering staff of various northwestern railroads, and served for a time as resident engineer on the International & Great Northern. He was then for four years in the employ of the Thomson-Houston Co., when he installed the electrical equipment of the West End Street Railway of Boston. From there he went to Chicago, taking charge of the Intramural, as stated above.

ELECTIONS AND APPOINTMENTS.

Arkansas Central.—At a meeting of the Directors held at Ft. Smith, Feb. 9, Dr. John S. Shibley of Paris, Ark., was elected President; Wharton Carnall of Ft. Smith, Vice-President, and C. E. Warner, Secretary and Treasurer. This road is still in the hands of a receiver.

Atlantic & Yadkin (Cape Fear & Yadkin Valley).—At a meeting held Feb. 8, the officers elected were as follows: General Manager, J. R. Kenly; Traffic Manager, T. M. Emerson; General Superintendent, J. F. Divine; General Auditor, W. A. Riach, and Secretary and Treasurer, J. F. Post, Jr. (General Railroad News column, Feb. 10, p. 111.)

Canadian Pacific.—S. Phipp, heretofore Road Foreman, has been appointed Assistant Master Mechanic, with headquarters at Winnipeg. His territory will extend from Swift Current to Port Arthur. J. Cardell, Trainmaster, will have headquarters at Laggan. F. E. Hobbs has been appointed Trainmaster of the Pacific Division, with headquarters at Vancouver, B. C. This line has extended its Pacific Division from Donald to Laggan, and will hereafter call the division the Mountain Section.

Central of Georgia.—A. W. Tinsley has been appointed Trainmaster, succeeding C. L. Bruner, transferred.

Chicago & Southeastern.—R. C. Conklin has been appointed General Manager, with headquarters at Anderson, Ind., to succeed Harry Crawford, Jr., who becomes Vice-President.

Chicago, St. Paul, Minneapolis & Omaha.—J. J. Ellis, heretofore Master Mechanic, has been appointed Superintendent of Motive Power and Machinery.

Chicago Terminal Transfer.—Henry S. Hawley, heretofore General Agent, has been appointed Traffic Manager.

Cincinnati, Hamilton & Dayton.—The jurisdiction of the Indiana, Decatur & Western officers is extended over the Chicago & Ohio River, which was taken over Jan. 31, to be operated as part of the I., D. & W., and will be known as the Ohio Division of that road. (Railroad News, Feb. 10, p. 111.)

Cincinnati, Hillsboro & Wellston.—The officers of this company, referred to in the "Construction" column, are: President, Milton McKeehan, Hillsboro, O.; Vice-President, Moses Morgan; Secretary and Treasurer, Cole Gillilan, Sinking Springs, Ohio.

Cleveland, Cincinnati, Chicago & St. Louis.—M. L. Morris has been appointed Assistant Engineer of the Chicago Division, with headquarters at Indianapolis, Ind.

Cooper Range.—The officers of this company, referred to in the Construction column, are: President, I. H. Seager, Houghton, Mich.; Vice President, Wm. A. Paine, Boston; General Manager, C. A. Wright, Houghton; Secretary and Treasurer, Frederick Starrwood, Boston; Chief Engineer, Thomas Appleton, Houghton.

Fort Worth & Denver City.—A. A. Glisson has been appointed General Agent, Passenger Department, with headquarters at Fort Worth, Texas, instead of Assistant General Passenger Agent, as erroneously stated in these columns some weeks ago. Effective this date.

Georgia & Alabama.—E. E. Anderson has been appointed General Freight and Passenger Agent, succeeding A. Pope.

Great Northern.—F. B. Walker has been appointed to a position in the Engineering Department.

Huntingdon & Broad Top Mountain.—At the annual meeting, held at Philadelphia Feb. 7, two new directors were elected as follows: A. Graham Elliot and Morris W. Stroud.

Lehigh Valley.—L. H. Van Allen, in addition to his duties as Superintendent of the Buffalo Division, will assume charge of the operations of the Lehigh Valley Transportation Co.

Missouri, Kansas & Texas.—J. A. Davis, heretofore Trainmaster, has been appointed Assistant Superintendent of the Hannibal, Sedalia & Kansas City Division. Norman J. Finney has been appointed Division Superintendent of that division, with headquarters at Franklin Junction. Dennis Sullivan has been appointed Superintendent of the Choctaw Division, with headquarters at Denison, Texas.

Natchez, Urania & Ruston.—The officers of this company, referred to in the Construction column, are: Henry F. Hardtner, President; Chas. W. La Croix, Vice-President; Geo. A. Southwick, Chief Engineer, all of Urania, La.; F. C. Brewer, General Freight and Passenger Agent, St. Louis, Mo.

Ogdensburgh & Lake Champlain (Rutland).—P. W. Clement has been elected President of the O. & L. C., succeeding Charles Parsons, resigned, with headquarters at Rutland, Vt. Henry G. Smith has been elected Treasurer of the O. & L. C., succeeding Charles G. Burnham, resigned, with headquarters at Rutland, Vt.

Oregon Short Line.—L. Malloy has been appointed Superintendent of the Montana Division, succeeding John McManis, assigned other duties. Effective Feb. 9.

E. Brown has been appointed Roadmaster of the Utah Division, succeeding James Latimer, who has gone to the Utah & Pacific.

Philadelphia, Wilmington & Baltimore.—E. F. Brooks has been appointed General Superintendent.

Quincy, Carrollton & St. Louis (Litchfield, Carrollton & Western).—C. M. Stanton, heretofore Agent for the Receiver of the L., C. & W., has been appointed General Manager of the Q., C. & S. L. George W. Dye has been appointed Auditor.

Seattle & International (Northern Pacific).—A Mr. Middaugh has been appointed Superintendent of Construction of the Pacific & Arctic RR. & Navigation Co. J. M. Campbell, who was formerly of the Washington & Columbia River Ry. Co., has been appointed to succeed Mr. Middaugh.

Southern.—C. B. Hayes, heretofore Acting Freight Auditor, has been appointed Freight Auditor, with headquarters at Washington, D. C.

C. R. Westcott has been appointed Trainmaster at Knoxville, Tenn., succeeding B. O. Payne, resigned. Effective Feb. 15.

Toledo, St. Louis & Kansas City.—Mr. F. J. Pease, Master Mechanic at Frankfort, Ind., has resigned and will be succeeded by Mr. C. Skinner, formerly Master Mechanic of the Alabama Great Southern.

Wabash.—E. Robertson has been appointed Foreman at Ashley, Ind., succeeding A. G. Hollinghead, formerly Assistant Master Mechanic at that place, and who has been assigned to other duties.

Wrightsville & Tennille (Oconee & Western).—M. V. Mahoney, heretofore General Freight and Passenger Agent of the O. & W., has been appointed Commercial Agent of the W. & T., with headquarters at Hawkinsville, Ga.

RAILROAD CONSTRUCTION, New Incorporations, Surveys, Etc.

ALABAMA, NEW ORLEANS, TEXAS & PACIFIC.—This company, which owns a controlling interest in a number of lines of the Queen & Crescent, voted at the annual meeting in London, Eng., Feb. 14, to build a connecting line between Wascom, Tex., and Jefferson.

ARKANSAS CENTRAL.—A large force of men was to have been put at work last week on the extension of this line to Paris, 18 miles, under order of Circuit Judge Rowe, of Fort Smith, Ark. (Feb. 10, p. 107.)

BANGOR & AROOSTOCK.—This company will issue its new mortgage on April 1, and a portion of the proceeds is to be used for improving the Bangor & Piscataquis, recently acquired. (Railroad News column, Jan. 20, p. 55.)

CANADIAN PACIFIC.—This company will make application at the next session of the Canadian Parliament for an act to authorize the building of an extension of the Stonewall branch in Manitoba north and northeast to a point on the west shore of Lake Winnipeg, between Gimli and Arnes; also for a line from a point on the same branch northwest to the shore of Lake Manitoba, between Marsh Point and the boundary of Township 25; also a railroad from a point at or near Reston, Manitoba, to run west to a point in the Moose Mountain district, thence northwest to a point at or near Regina.

CENTRAL OF GEORGIA.—This company, according to report, will build a four-mile spur from Covington, Ga., to the Porterdale Mill, which is owned by the Bibb Manufacturing Co., of Macon. Contractors are bidding for the work.

CHICAGO & EASTERN ILLINOIS.—Surveys are in progress for the Eastern Illinois & Missouri River extension of the St. Elmo Division from Marion, Ind., southwest about 50 miles to Cape Girardeau, to connect with the St. Louis Southwestern. (Feb. 3, p. 92.)

CHICAGO, MILWAUKEE & ST. PAUL.—Right of way is being secured into Marshalltown, Ia., according to report, for a branch into that city from either Pickerton, seven miles, or from Tama, 15 miles, to run northwest.

CINCINNATI, HILLSBORO & WELLSTON.—This company has just sent J. W. Jones, a railroad promoter of Gallipolis, O., over this proposed line, and his report is enthusiastic. The proposed route is from Jackson, O., west 112 miles, via Jasper and Hillsboro to Milford; thence via the tracks of the Pittsburgh, Cincinnati, Chicago & St. Louis west into Cincinnati. Two complete surveys have been made for this line, and over 90 per cent. of the right of way is owned by the company. About $120,000 worth of work has been completed. The officers are given under "Elections and Appointments." (July 31, 1896, p. 545; Aug. 5, 1898, p. 571.)

COPPER RANGE.—Location is nearly completed for this proposed line from Houghton, Mich., southwest 55 miles to Rockland, on the Chicago, Milwaukee & St. Paul. The maximum curves are 2%, and the maximum curves 14 deg. The rails, 75-lb. weight, are already purchased. Contracts are to be let for grading, track laying, etc., on April 1. (Official.) The officers are given under Elections and Appointments. (Feb. 10, p. 108.)

FLINT & PERE MARQUETTE.—A committee of Port Huron, Mich., citizens recently consulted with General Manager Crapo regarding an extension of the road from that city south along the river to the Bunce farm, where the Jenks Shipbuilding Co. proposes to locate a steel ship building plant. The right of way for the extension is practically secured.

GEORGIA NORTHERN.—Notice is given of application for a charter to extend the line from Moultrie, Ga., southwest about 30 miles to Thomasville.

GULF, TEXAS & NORTHERN.—Judge J. C. Beeks, of Orange, Texas, chief promoter of this road, states that work is to be begun about the first of March. The line as projected is to run from Orange, Texas, north 188 miles to Marshall. (Jan. 27, p. 72.)

HAWKINSVILLE, FITZGERALD & GULF.—Rails are bought, according to report, and grading is to be begun soon on this proposed line from Hawkinsville, Ga., south via Fitzgerald to a point in Florida on the Gulf of Mexico. H. V. Bowen, of Luluville, Ga., and P. H. Fitzgerald, of Fitzgerald, are among the incorporators. (Nov. 11, 1898, p. 820.)

HUNTINGTON CONNECTING.—This company has been formed in Huntington, W. Va., to build a freight line around the suburbs, connecting the various railroads entering the city and the principal factories. John W. Ensign, of Huntington, is a director.

KANSAS CITY, PITTSBURG & GULF.—Track is laid for the entire distance on the northern cut-off from Trimble, Mo., north 10¼ miles to Gower. Surfacing and ballasting will be completed as soon as the weather conditions permit. (Jan. 13, p. 33.)

LAKE SHORE & MICHIGAN SOUTHERN.—This company is reported to have bought land at Ashtabula, O., on which to lay six additional half-mile sidings.

LINVILLE RIVER.—Grading has been resumed, according to report, on this line from Cranberry, N. C., on the East Tennessee & Western North Carolina, to run southeast about 14 miles to Linville. Considerable work was done about two years ago. A. B. Camp, of Montezuma, N. C., is President. (March 12, 1897, p. 105.)

LITTLE ROCK & GULF.—This company has been incorporated in Arkansas, with a capital stock of $1,800,000, to build a 125-mile line from Little Rock through the counties of Pulaski, Saline, Grant, Cleveland, Dallas, Calhoun and Bradley to a point on the State line in Union county. The incorporators are: A. B. Banks, J. G. Pattilo, J. E. Hampton, J. F. Erwin, G. W. Smith, E. A. Acrumen, Charles McKee, Fordyce; Oscar Davis, J. B. Jones, W. A. Bright. Contracts are to be let in March for this line from Hope, Ark., southeast 24 miles to Stamps. The company will use 45-lb. rails. W. I. Foster, of Hope, Ark., is President.

LOUISIANA ROADS.—C. E. Ball & Sons, of Ball, La., will build a lumber road 3½ miles long, using 30-lb. rails.

M'CLOUD RIVER.—The Superintendent writes that the company does not expect to extend its main line this season, and the only building will be some temporary spurs for logging purposes. (Jan. 27, p. 73.)

MEXICAN CENTRAL.—The company is relaying tracks, ballasting and cutting down grades between the City of Mexico and Torreon, and between Tampico, Mex., and Yurecuro. Track laying is to begin on the Michoacan Pacific extension from Yurecuro southeast toward Ario. (Nov. 4, 1898, p. 804.)

MEXICAN ROADS.—Consul John Barlow of Mexico, writes as follows:

The Mexican Senate has approved the contract dated Oct. 12, 1898, between the Secretary of Communications of the Republic and José Maria Botella, for the construction of a railway from Parral, in the State of Chihuahua, to Minas Nuevas, with the privilege of extending the same to the mining district of Concepcion. The

Senate has also approved the contract with Mariano Gallardo and Anacarsis Peralta for the construction of two lines of railway in the States of Tabasco and Chiapas, the starting point of one of which is Pichucalco, to strike the River Blanquillo at the most convenient point; the other to run from Teapa to the most convenient point upon the river of the same name. Interested persons may be able to reach the concessionaries of these projected lines by addressing them in care of the Minister of Communications.

MINNEAPOLIS & ST. LOUIS.—The stockholders on Feb. 14 voted to extend the line from New Ulm, Minn., south about 150 miles to the Illinois Central tracks in Iowa. The General Manager writes that building will be carried forward during the coming year. Engineering parties are in the field, but no contracts have been let. Tracks will be laid with 70-lb. steel, which has been bought. (Feb. 3, p. 92.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The extension from Kulm, N. D., west toward Bismarck, which was completed to Streeter, 77.5 miles, will be finished into Bismarck,, 32 miles more, early this coming year. (Jan. 6, p. 16.)

MISCELLANEOUS COMPANIES.—The James P. McDonald Co. has been incorporated in West Virginia, with a capital stock of $200,000, to build railroads, wharves, docks, etc. The principal office is New York City. Among the incorporators are: Charles Engel, John French and Ernest Atkinson, of New York city; Edward W. Starr, of Brooklyn, and Theodore Holden, Jr., of White Plains, N. Y.

MONROE RAILWAY & CONSTRUCTION CO.—The Louisiana North & South (Nov. 4, p. 804), incorporated in Louisiana last October to run from New Orleans northwest 335 miles through Camden, Ark., Arkadelphia and Hot Springs to Fort Smith, has been consolidated with the line of the Monroe Ry. & Construction Co. The section from Monroe, La., southwest 89 miles via Winfield to Natchitoches, is to be built first, and grading is to be begun within the next 30 days. A. L. Atkins, of Arcadia, La., is General Manager. (Feb. 3, p. 93.)

MOULTON, ALBIA & DES MOINES.—This company was incorporated in Iowa, Feb. 10, with a capital stock of $200,000, to build the proposed extension of the Wabash from Moulton north 27 miles to Albia. The incorporators are: Ossian D. Ashley, of New York, and others connected with the Wabash.

NATCHEZ, URANIA & RUSTON.—The Urania Lumber Co. is building this line projected from Natchez, Miss., northwest 122 miles via Urania, La., on the St. Louis, Iron Mountain & Southern, to Ruston, Surveys have been completed from Urania northwest toward Ruston, 25 miles. Grading was begun Jan. 1 on this section, and the company will have 10 miles in operation by Sept. 1. It will be used chiefly as a logging road, although the other resources of the country are considerable. The route is comparatively level, and the work will not be difficult. C. W. LeCroix, Urania, La., is the principal contractor. There are 50 men at work. The line will be standard gage and laid with new 50-lb. rails. (Official.) The officers are given under Elections and Appointments. (Louisiana Roads, Jan. 20, p. 53.)

NATIONAL YUCATAN SOUTHEASTERN.—At a meeting of the stockholders held at Merida, Dec. 30, the officers and directors were elected as follows: Martin Peraza Pacheco, President; José Maria Ponce, Vice-President; Directors, Augusto Luis Peon, Manuel Zapata Martinez, Manuel Espinoza Rendon, Ramon Ancona Bolio, Manuel Peon Zetina, Engineer David Casares, Enrique Cámara, Vicente Solis Leon, Luis F. Urcelay, Enrique Munoz Aristegui, José Valles Castillo, Julio Lavada Peon, and José Rosado, Secretary.

NORTH & SOUTH CAROLINA.—This company has been incorporated in North Carolina to build a railroad from Columbia, S. C., north across the State of North Carolina to Virgilina in Person County, on the northern boundary of North Carolina. J. A. Leak, of Wadesboro, N. C., is interested.

NORTHERN PACIFIC.—The Clearwater Short Line Co. has filed location for right of way from a point south of Colfax, Wash., southwest along the Pennawawa Creek to the Snake River, and thence across the river to the proposed line on the south bank. (Feb. 10, p. 108.)

Wrenn & Greenough, who have the contract for the Clearwater Short Line from Lewiston, Id., east 75 miles to Missoula, Mont., report about 1,000 men at work. If good weather continues they hope to be able to lay track at the rate of a mile a day. The graders are pushing their work along, and will be able to keep well in advance of the trackmen. (Dec. 23, 1898, p. 923.)

Surveys are completed, according to report, for a cut-off for the line from Waitsburg on the Washington & Columbia River line west 16 miles to Riverside. This would save about 40 miles in the line which now runs by heavy grade south to Dixey.

NORTHWEST TERRITORY ROADS.—Messrs. Eberts & Taylor, of Victoria, B. C., give notice of application to the Canadian Parliament, at its next session, for an act to build a line from Dawson City, Yukon District, to the forks of Eldorado and Boundary creeks, and to the head of Dominion and Sulphur creeks, in the Klondike mining division; also branch lines not exceeding 30 miles each.

OREGON RAILWAY & NAVIGATION.—Camps have been established at Pennawawa, Wash., and Almota for grading the Clearwater Valley line from Riparia east to Lewiston, Id. The forces are doing heavy rock work, preparatory to the large grading outfits to be put at work early in the Spring. (Jan. 27, p. 73.)

OTTUMWA & NORTHERN.—This company was incorporated in Iowa, Feb. 8, with a capital stock of $300,000, to build a line from Ottumwa, Ia., north to a connection with the Iowa Central at some point in the counties of Keokuk, Manhaska or Monroe. The incorporators and directors are: T. D. Foster, J. G. Hutchinson, J. T. Hackworth, Samuel Mahon, W. B. Bonnifield, William Daggett, F. W. Simmons, E. E. McElroy, S. H. Harper, W. A. Work, W. A. McIntyre, H. L. Waterman, J. S. Sax, A. W. Lee, A. W. Buchanan.

PARRAL & DURANGO.—The company will let contracts about the end of February for grading, track laying and bridges on this proposed line from Parral, State of Durango, Mexico, to run into the State of Durango, about 50 miles. Building will be begun in March. The maximum grades are 3 per cent., and the maximum curves 20°. (Feb. 3, p. 93.) Samuel E. Gill of Pittsburgh, Pa., is President. (Official.)

PECOS VALLEY & NORTHEASTERN.—The last spike was driven Feb. 11 on the extension from Roswell, N. M., northeast 206 miles to Amarillo, Tex. (Feb. 3, p. 93.)

PENNSYLVANIA.—A branch is being built, according to report from Carpenterville, N. J., northeast about four miles to Whittaker on the Lehigh Valley.

PORT HURON, LEXINGTON & WESTERN.—The Bay City, Mich., Board of Trade has received a letter from Edward H. Brennan, of Toledo, O., Vice President and Engineer of this company (successor to the Port Huron & Lexington), stating that the line is to be completed soon. The roadbed has been graded as far west as Lexington, Mich. The western terminus is to be either Bay City or Saginaw. (Jan. 27, p. 73.)

QUEEN ANNE'S.—It is reported that this company will begin shortly the extension of its line from Lewes, Del., southeast about six miles to Rehoboth. The company now uses the Pennsylvania tracks between these points.

RUTLAND.—O'Brien & Sheehan of New York were the lowest bidders for the Rutland & Canadian extension from Burlington, Vt., north about 50 miles through the chain of islands in the northern part of Lake Champlain to Alburgh. The bids ranged from $499,000 up to $1,100,000. The bids do not include the building of 800 ft. of steel bridging, with three spans. Work must be begun within one week after signing the contract, and be completed by Sept. 1. (Jan. 27, p. 73.)

ST. LOUIS & NORTHERN SHORT LINE.—An official telegraphs that 100 miles of railroad work is ready to be let by the Lascede Construction Co., Security Building, St. Louis, Mo., on the proposed extension from Peoria north to East Clinton, Ill. (Feb. 3, p. 93.)

ST. LOUIS SOUTHWESTERN.—The company has sold an additional $1,000,000 of second mortgage bonds, the proceeds of which will be used for improvements and betterments.

SUMMERVILLE, BLUE MOUNTAIN & WALLA WALLA.—J. L. Story of Union, Ore., attorney, is reported as saying that grading is to be begun as soon as the weather permits. for this line from Union via Summerville and Elgin to Walla Walla, Wash., about 80 miles. Surveys have been made from both ends into the Blue Mountains. P. J. Taylor of Union, Ore., is President. (Jan. 13, p. 33.)

TACOMA & COLUMBIA RIVER.—A contract made between M. T. Ward and this company for building 35 miles of the road on the southern extension to the Pisqually River was filed at Tacoma, Wash., Jan. 30. It bears the date of Dec. 17, and provides that work was to be begun within 30 days. Mr. Ward has the further privilege of continuing building to the Columbia River. (Jan. 13, p. 34.)

TENNESSEE CENTRAL.—Among the sub-contractors for the first 20 miles of this line from Harriman, Tenn., to Clarkesville, are the following from Knoxville, Tenn.: John Sullivan, 1½ miles; Doyle & Griffiths, 2 miles; F. F. Smith, 2 miles, and Alexander Watt, 1 mile. (Feb. 10, p. 109.)

TEXAS ROADS.—Representative Bennett has introduced a bill into the Texas House to amend the Constitution of the State so as to authorize the State to build a relief railroad from the Gulf coast to the boundary on the north on the Red River, and to own in whole or in part the same. The resolution provides for the appointment of three engineers to be selected, one each by the Governor, the Supreme Court and the Legislature, who are to select the line and terminal points. The Legislature may provide for State ownership or for a loan by the State, as exclusive holder of bonds, not to exceed $10,000 per mile.

UNION PACIFIC.—New rails are reported on hand for relaying 44 miles of track on the Julesburg line, as soon as that property, now in the hands of the Colorado & Southern, comes into the possession of the U. P.

UNION, CORNUCOPIA & EASTERN.—S. O. Swackhamer has filed an attachment upon the plant of this company at Union, Ore., and grading is suspended. The road is projected from Union southeast through Pine Valley to Ballard's Landing, and thence to Bear. Idaho. Joseph Johnson of Portland, Ore., is the promoter. Grading was begun last November. (Dec. 2, 1898, p. 868.)

UTAH, NEVADA & CALIFORNIA.—This company was incorporated in Nevada, Feb. 2, with a capital stock of $5,000,000, to build the Nevada extension of the Utah & Pacific from the state line southwest across Nevada toward Los Angeles, Cal. The line is nearly completed from Milford, Utah, southwest 76 miles to the Nevada state line. The incorporators of the new company are as follows: C. M. Dull, Charles D. Savery and Albert E. Kimball of Salt Lake City; A. C. Cleveland of Cleveland, Nev.; and T. J. Osborne of Pioche, Nev.

WASHINGTON & SEABOARD.—This company has been incorporated in Maryland, with a capital stock of $1,250,000, to build a line from Hyattsville to Point Lookout. Among the incorporators are: Albert B. Linderman, of Philadelphia, and Charles Merriken, of Baltimore. Mr. Linderman is also interested in the Washington St., Mary's Bay & Point Lookout, which was incorporated in Maryland, in 1897, to connect Washington, D. C., with Point Lookout, over practically the same route as this road. (Sept. 24, 1897, p. 681.)

WASHINGTON ROADS.—William M. Tiffany, of New York, and William H. Llewellyn have been negotiating for franchises and right of way for a railroad from Seattle south to Portland, Ore.

WISCONSIN ROADS.—The Merchants & Manufacturers' Association of Milwaukee, of which H. B. Wilkins is Secretary, is considering the question of a belt road around that city, and may recommend the raising of $500,000 as a bonus.

WORTHINGTON & ONAPING.—The route for this proposed line is from Worthington, Ont., north to Onaping, and thence to Vermillion Valley. Application will be made for incorporation to the Ontario Legislature at its next session. The capital stock is $300,000, and the general office Sault Ste. Marie, Ont. The directors are: H. W. Evenden, John McKay and W. H. Hearst, all of Sault Ste. Marie, Ont. Contracts for building will be let about May, and for rails and rolling stock about a month later. (Sault Ste. Marie, Ont.. Elec. RR. Construction column, Feb. 3, p. 94.)

Electric Railroad Construction.

ALBANY, N. Y.—It is stated that the Albany, Helderberg & Schoharie Electric Ry. Co. is in the market to buy railroad ties, so as to be ready for completing the road in the spring. The proposed route of the road from Albany includes Normansville, Elsmere, New Salem, Indian Ladder, East and West Berne to Schoharie. Richard Schermerhorn of Brooklyn, N. Y., was made Chief Engineer last June. It is stated that the Albany Construction Co. has several of the contracts. (June 10, 1896, p. 421; Oct. 14, 1898, p. 751.)

ALLENTOWN, PA.—The right of way from Emaus to Macungie for the Allentown & Emaus Electric St. Ry., has practically been secured, and the work on the extension will be begun early in the spring. (Sept. 9, 1898, p. 657.)

APPLETON, WIS.—The Fox River Valley Electric RR. has petitioned the City Council of Kaukauna for a franchise for its proposed extension to that town. The right of way along the north bank of the Fox River has been secured to within a mile of Kaukauna. F. G. Kurz, Superintendent. (Jan. 27, p. 73.)

ATLANTA, GA.—The Atlanta Ry. Co. is preparing to begin work on its extensions now that the restraining orders imposed by the courts have been dissolved. Orders for new cars and rails required for the extensions will shortly be placed. F. M. Zimmerman is Superintendent and Electrician. (Dec. 9, 1898, p. 886.)

AUBURN, N. Y.—The Auburn Interurban Electric RR. Co. has filed a certificate with the Secretary of State for permission to build several extensions. (March 4, 1898, p. 170.)

BANGOR, ME.—Flavius Obeal of Bangor, according to report, is interested in the project to build an electric railroad from Naples to Newhall, on the Maine Central RR.

BESSEMER, ALA.—W. T. Kennedy has petitioned the City Council for a franchise for an electric railroad through the city streets, the termini of which would be at the works of the American Pipe Foundry Co. and the mines of the Sloss Iron & Steel Co., on the outskirts of the city.

BIRMINGHAM, MICH.—The Bloomfield & Orchard Lake Ry. Co. is the name of the company which was recently granted a franchise to build an electric railroad from Circle City to Birmingham and Orchard Lake. The incorporators are George E. Daines, Almeron Whitehead, Frank Hagerman, M. F. Lillis of Pontiac, and George T. Hendrie of Detroit. The authorized capital stock is $25,000, and the principal office will be in Birmingham. (Dec. 9, 1898, p. 886.)

BLUEHILL, ME.—According to report, Rufus P. Grindle of Bluehill, and others, have petitioned the Legislature for the incorporation of the Bluehill & Bucksport RR. Co., to build an 18-mile railroad between the places named in the title, via Penobscot and Orland. The proposed capital stock of the company is $250,000.

BORDENTOWN, N. J.—The Board of Freeholders of Burlington County will give a hearing March 7, on the application for a franchise by the Monmouth Traction Co.

BOSTON, MASS.—The Lynn & Boston St. Ry. Co., which is controlled by ownership of stock by the North Shore Traction Co., has made application for an increase of its capital stock of $1,266,000 by $960,300. The additional capital will be expended in changing the motive power, reconstruction of tracks, retirement of $630,000 coupon notes outstanding, and for contemplated improvements. The company will probably build extensions to Chelsea and Everett.

The contract for building the additional elevated structure of the Boston Elevated Ry., in Washington St., and Main St., Charlestown, has been awarded to the A. & P. Roberts Co., representing the Pencoid Iron Works. The contracts included the structure only, and not foundations, tracks or stations, and amount to nearly half a million dollars.

Including the work for which contracts have already been let, the B. E. Ry. has now practically let contracts for the entire line from Dudley St., in Roxbury, through the subway to Sullivan St., Charlestown. (Jan. 20, p. 54.)

BOULDER, COL.—The Mayor of the city has declined to accept the bond recently presented by W. A. McMansur and W. E. Reed as a guarantee to build the electric railroad for which they have a franchise. This bond is for $10,000, and it is stated that Boston capitalists are behind the enterprise. As soon as matters are adjusted with the city work will be pushed rapidly. (Feb. 3, p. 93.)

BRIDGETON, N. J.—The Fairfield Township Committee, Jan. 9, passed the ordinance granting a franchise for the extension of the Bridgeton & Millville Traction Co., between Fairton and Cedarville. This company is gradually securing right of way for its proposed extension, which will be built as soon as the entire right of way is secured. The Lawrence Township Council granted right of way last week. (Jan. 27, p. 72.)

BUFFALO, N. Y.—According to report, the Buffalo & Lockport Ry. Co. has in consideration the advisability of an extension to Olcott. General Manager Burt Van Horn is reported as stating that the line will probably not be built this year, as the right of way will not be secured in time for its completion.

CAMBRIDGE, O.—The Cambridge & Byesville Electric Ry. Co. was incorporated Feb. 10, with an authorized capital stock of $20,000. The incorporators are: Leopold Loeb, A. E. Townsend, W. B. Greene and T. E. Amos.

CASTINE, ME.—The Maine Legislature has been petitioned to incorporate the Castine & Eastern RR. Co., to build a road from Brookville, opposite Castine, through the towns of Brooksville, Penobscot, Sedgwick and other small towns to Hancock. The road is to be standard gage and operated by electricity, compressed air or steam. The company is also

authorized to run a steamboat line between Castine and Brooksville. The incorporators include J. N. Greene, George M. Warren and Judge E. E. Chase.

CHARLOTTE, N. C.—According to report, P. M. Brown is interested in a project, to be known as the City & Suburban Electric Ry. Co.

CLEVELAND, O.—The petition for an electric railroad franchise through Brooklyn, Parma and Royalton, also a branch 2½ miles south through York St., was filed with the County Commissioners Feb. 4 by I. K. Pierson, of Painesville. Mr. Pierson, according to report, is endeavoring to secure a franchise for an electric railroad from Cleveland to Wadsworth. He now possesses the franchise which was granted four years ago to the Cleveland, Wadsworth & Southern Ry. Co.

The stockholders of the Akron, Bedford and Cleveland, at a meeting held Feb. 6, authorized a refunding bond issue of $1,000,000. Besides redeeming about $300,000 of bonds already issued, a part of the new issue will be used for double tracking and improving the road, and building a four-mile extension. (Jan. 20, p. 56.)

CUMBERLAND, MD.—The stockholders of the Cumberland & Frostburg, the Frostburg & Lonaconing, and the Lonaconing & Westernport electric railroads, at the annual meeting, Feb. 9, elected the following officers for the three lines: President, E. F. Walker, Philadelphia; Vice-President, J. W. Burchinal, Moundsville, W. Va.; Secretary, George D. Powell, Philadelphia; Treasurer, Frank B. Sweeten, Camden, N. J.; I. Engle Cochran, Jr., Chester, Pa., and Isaac A. Walker, Philadelphia, General Directors. President Walker is of the firm of Isaac A. Walker & Son, general railroad contractors, Philadelphia, who have a controlling interest in the proposed line. The rails and copper to be used in building the line have already been purchased, but contracts for building are yet to be let. Work will be begun as soon as the weather opens and pushed from both ends of the line. It is expected to have the road in operation by Sept. 1. The company controls four lines now in operation. (Jan. 6, p. 16.)

DAYTON, O.—According to report, the Dayton & Xenia Traction Co. has purchased the Dayton, Springvalley & Wilmington Electric RR., which line joins it on the outskirts of the city. Work is being pushed rapidly, and it is proposed to have these lines finished and in operation by July. The following officers were elected at a recent meeting: Clement J. Ferneding, President; J. N. Wilson, Vice-President and General Manager; H. L. Ferneding, Secretary, and Philip A. Kemper, Treasurer. (Nov. 11, 1898, p. 821; Jan. 20, p. 54.)

ENFIELD, CONN.—A hearing was given by the Committee on Railroads of the State Legislature Feb. 7, for an extension of the time for the completion of the lines of the Enfield & Long Meadow Electric Ry. This company proposes to build through the streets in Enfield, Suffolk and Somers. A resolution was also brought before the committee to extend the time for the completion of the East Windsor Electric Ry. Co., to build north to connect with the Enfield & Long Meadow in Warehouse Point by Nov. 1, 1899.

J. Warren Johnson, who is interested in the above companies, also asked for the incorporation of the Warehouse Point & South Windsor Ry. Co. A hearing will be given on the application in about two weeks.

ESCANABA, MICH.—The Escanaba Electric St. Ry. Co. is about to build a three and one-half mile extension from the town of Wells to the "Soo Line" station. Two 40-ft. motor cars, five open and three closed trailer cars will be required, but we are informed that no bids will be asked for the same. The company also intends to do its own building, and will probably commence work in April without letting contracts. At present the company rents its power, but this season intends to build a new 250 h. p. power house. A. R. Moore is President, Manager and Purchasing Agent. (Aug. 26, 1898, p. 619.)

FORT WORTH, TEX.—The Glenwood & Polytechnic College St. Ry., according to report, has bought the Fort Worth & Arlington Heights St. Ry., which it has heretofore operated under a lease. It is stated a number of improvements will be made. J. T. Voss is President and General Manager.

FITCHBURG, MASS.—Contracts will probably be let in March or April for building the eight miles of electric railroad proposed by the Fitchburg & Ashby Ry. Co. This company was incorporated in March, 1898, with a capital stock of $70,000. The officers are: President, F. W. Wright; Vice-President, W. O. Loveland; Secretary, E. A. Hubbard; Treasurer, H. F. Bingham; Electrician, Albert Wilder. Plans are yet to be decided upon as to the kind and number of cars, and also as to the particulars for the power-house. The general office is at Ashby, Mass. (Sept. 16, 1898, p. 679.)

FREDERICK, MD.—L. Victor Baughan, President of the Frederick, Thurmont & Northern Ry. Co., informs us that his company would like to communicate with some construction company to build the road. The company now has in operation a road from Frederick to Middletown, which earned 10 per cent. last year. It has recently been extended to Myersville, 5½ miles, and will be connected with Hagerstown in the spring, making a road of about 26 miles. The company's charter permits it to carry freight. There are no heavy grades or bridges. This company was incorporated early in 1898, and has a capital stock of $150,000, which will be increased when it is necessary. (May 3, 1898, p. 349.)

HAMILTON, O.—The Hamilton & Eaton Electric Ry. Co. was recently granted a franchise by the Commissioners of Preble County. The company also has franchises through Butler County. Surveys for the route will be begun as soon as the weather permits. J. E. Anderson is President. (Jan. 27, p. 74.)

INDIANAPOLIS, IND. — The County Commissioners on Feb. 7 granted a 50-year franchise for an interurban line of electric railroad to Bridgeport on the National road, to D. P. Erwin, Daniel Ransdell and Frank M. Parry. Work is to be begun not later than Sept. 1, this year, and completed by the same date in 1901. (Feb. 10, p. 109.)

JAMESTOWN, R. I.—N. S. Littlefield and J. P. Kohler have petitioned the Council for a franchise to build on Narragansett Ave.

KANSAS CITY, KAN.—The Kansas City & Leavenworth Traction Co., which recently purchased the rights and franchises of the Wyandotte County Ry., has a capital stock of $250,000. Grading is now in progress by the Leavenworth Construction Co. of Lansing, Kan., on the 21 miles of the proposed road between Kansas City and Leavenworth. The company proposes to use 60-lb. steel rails on the road. H. G. Purt is President and C. H. Chapin is Secretary. (Dec. 23, 1898, p. 924; Jan. 20, p. 54.)

KANSAS CITY, MO.—The Missouri Electric Ry. Co., which was organized last summer (Oct. 7, 1898, p. 733), was incorporated Feb. 9, with an authorized capital stock of $500,000. The incorporators are: Frank W. Sears, Chett McDonald, A. J. Lightner and others.

KENOSHA, WIS.—It is stated that a company has in consideration the advisability of building a branch line from Kenosha to the village of Pleasant Prairie, six miles west of the city, where large powder mills are being built. Vice-President Isaac Bishop, of the Milwaukee, Racine & Kenosha, is reported as offering to take 50 per cent. of the stock of the company.

LEXINGTON, KY.—The Belt Electric Line, according to report, is considering several extensions and improvements. C. J. Bronstear is President.

LOS ANGELES, CAL.—Articles of incorporation were filed for the Pacific Electric Ry. Co. Feb. 3. This company, acording to its petition, desires permission to build to any part of Los Angeles, San Bernardino, Riverside and Ventura counties. It has not been decided what the motive power will be, but it may use steam, cable or electricity. The capital stock is $1,000,000. The incorporators are I. W. Hellman, J. Kuhrts, Chas. Seyler and others.

LOWELL, MASS.—According to report, Wm. H. Anderson is interested in a project to build an electric railroad connecting Pelham with Lowell.

MAGNOLIA, MASS.—The Magnolia St. Ry. Co., according to report, has a capital stock of $60,000, and will build an electric railroad between Gloucester and Magnolia. Wm. B. Ferguson of Malden and D. S. Pierson of Gloucester are interested.

MAPLEWOOD, MO.—J. T. Donovan, J. T. McDermott, Michael Hammell, H. J. Webber, under the name of the Maplewood & Jefferson Barracks RR. Co., have filed a petition in the St. Louis County Court at Clayton for a franchise to build a double-track electric railroad between Maplewood and the Army Barracks. The road will begin at Marshall Ave. and Manchester road, and run south. The incorporators agree to macadamize all streets for 12 ft. on each side of the outer rail, and widen culverts and bridges and also to charge a five-cent fare.

MIDDLETON, MASS.—This town will build and operate about 2 miles of electric street railroad. M. M. Merritt, chairman of Railroad Committee, may be addressed.

MILWAUKEE, WIS.—The Milwaukee Electric Ry. & Light Co. has the right of way for the extension of its Eighth St. line on Hopkins road to the city limits for its extension to North Milwaukee. The line now extends to within about a mile of the city limits, and it is stated that the company is now in possession of the franchise for the continuation of the line. (Dec. 2, 1898, p. 869.)

MOLINE, ILL.—The Tri-City St. Ry. Co. has been granted a 25-year franchise by the city of Moline, on the condition that the company purchase the Moline Central St. Car Line, and give a good, up-to-date service, including a five-cent fare. The M. C. has not been operated since November, 1896.

MOUNTAIRY, N. C.—A. H. Patton, of Welch, W. Va,. according to report, is interested in a project to build a narrow gage railroad, presumably electric, from Mountairy, in Surry County, to a point on the Dan River, 15 miles distant. A contract has been let for grading, and other contracts will probably be let, so as to complete the road within five months.

MT. VERNON, N. Y.—Mayor Fiske of Mt. Vernon, in a special message to the Board of Aldermen, suggets that permission be given the Union RR. Co. to lay additional tracks in East Third St., from South Fourth Ave. to the easterly city limits. (Feb. 3, p. 94).

The Westchester Electric RR. Co. has filed notice of its intention to extend the lines in Pelham from the Mt. Vernon boundary line, along South Fulton Ave., to the Boston Turnpike to Pelham Manor, through the streets of that place, and connect with the present line of the company in Pelhamdale Ave. The applications made by the Union Ry. are practically for extensions of the W. E. (Jan. 1, p. 34; Jan. 27, p. 74.)

NEW BRITAIN, CONN.—The Central Ry. & Electric Co. proposes to build an extension from Plainville to Southington. E. H. Mather, General Manager. (Dec. 30, 1898, p. 939.)

NEW YORK, N. Y.—The State Railroad Commissioners have granted the application of the Metropolitan St. Ry. Co. and the Broadway and Seventh Ave. RR. Co. for a change of motive power to underground electric. The Board did not pass upon the application for the use of compressed air and storage batteries. The New York & Harlem RR. Co., leased by the Metropolitan, also secured permission to change its motive power to underground electricity. (Jan. 20, p. 54.)

ONEIDA, N. Y.—W. E. Northrup, President of the Oneida Ry. Co., informs us that the company does not contemplate making any extensions of the road at the present time. (Feb. 10, p. 110.)

PITTSBURGH, PA.—The Monongahela St. Ry. Co., which of late has been incorporating several new companies to build extensions for the line, has purchased a site for a new power-house, to be used in connection with the extension of its line from Braddock to McKeesport.

PETERSBURG, VA.—The Piedmont Traction Co. has accepted franchises for a local road recently granted by the Common Council in Petersburg. The company is now making a survey of the proposed route. See "Richmond," below. (Aug. 12, 1898, p. 587.)

PORT ARTHUR, ONT.—Thomas A. Gorham, barrister, informs us as to the charter which he will ask of the next session of the Ontario Legislature. It is the intention of the promoters to build from navigable water on Lake Superior, northward up the valley of the Nepigon River to Lake Nepigon. This road will be about 25 miles long, and will be first operated by steam, but as soon as water privileges along the Nepigon River are secured, a change will be made to electricity. The road will be built for the lumber trade in that district and will need several bridges. (Feb. 3, p. 94.)

PORTSMOUTH, VA.—The Portsmouth & Smithfield RR. Co. is reported organized, with H. L. Maynard as President, Col. C. Fenton Day of Smithfield, Va., as Vice-President, to build a 35-mile electric railroad.

PROVIDENCE, R. I.—The poles and other supplies for changing the lines of the New York, New Haven & Hartford RR., between Providence, Warren, Bristol and Fall River into an electric railroad, have reached Bristol. Work will probably not be begun until late in the spring. (Oct. 7, 1898, p. 733.)

RICHMOND, IND.—According to report, several Wayne County capitalists have filed articles of incorporation of the Cambridge City Interurban Traction Co., with a capital stock of $50,000. The company proposes to build an electric line from Cambridge City to Milton, Dublin and East Germantown.

The Richmond, Oxford, Reilly & Cincinnati Electric Ry. Co. is reported incorporated, with a capital stock of $2,000. The incorporators, who are Oxford and Reilly business men, are: Caleb A. Shera and A. F. Sloan, of Oxford; J. F. Gillespie, H. H. Smith, M. E. Fye, H. L. Roll and J. M. Duncan.

Wm. Pickens of Indianapolis, and Noah Clodfelter of Anderson, have accepted a franchise from the city of Richmond for the electric railroad through that place.

RICHMOND, VA.—The Virginia Electric Ry. & Development Co., which was incorporated in December, has secured control by purchase of the Piedmont Traction Co. of Piedmont, Va. It is stated that impavements and extensions are to be made. See "Petersburg," above. (Feb. 3, p. 96.)

RUTLAND, VT.—The Lake Dunmore Power & Traction Co. has completed preliminary surveys for the electric railroad from Lake Dunmore to Pittsford, via Brandon. The directors of the company are E. S. Marsh, C. H. White, C. H. Bump, W. T. Dewey and E. D. Blackwell. Mr. White is acting as General Manager and George H. McLeod Treasurer. (Dec. 9, 1898, p. 886.)

ST. LOUIS, MO.—Contracts for the building of the Wellston, Creve Coeur & St. Charles Electric RR. will probably be let in a few days, and work on the line is to be pushed as fast as possible thereafter. It is expected that the line will be finished to the Missouri River, opposite St. Charles, within 60 days. Specifications for the work can be had on application. Nearly all the right of way for the proposed line has been secured, much of which is through private property. The officers of the company are: J. B. C. Lucas, President; J. H. Bobb, Secretary; J. H. Chambers, Treasurer, and Judge R. Schencko, E. T. Thomas, George R. Wise, Charles P. Damon and T. T. Lucas, Directors. Many of the Directors are owners of property on the route.

SAN BERNARDINO, CAL.—Former Post-Master James H. Boyd, of San Bernardino, according to report, is about perfecting his plans for an electric railroad between San Bernardino and Redlands. He will shortly make application for a franchise for the proposed road, which will start on Third St., from the Santa Fe station, run east to D St., thence north to Redlands. Last July we stated that Mr. Boyd was considering this undertaking. (July 15, 1898, p. 523.)

SAN DIEGO, CAL.—An ordinance was recently introduced into the City Council, authorizing the San Diego, Pacific Beach & La Jolla Ry. Co., which now operates four miles of steam road, to change the line to electricity. The ordinance has been laid over for 30 days. This company has a capital stock of $25,000. R. P. Dabney is President.

SAN FRANCISCO, CAL.—The Market St. RR. Co. will soon do away with the last of the horse-cars in that city. It is gradually changing its roads to electric. Besides changing the lines to electric power, several extensions are proposed.

SAUNDERTOWN, R. I.—The Saundertown Steamboat & RR. Co. will be incorporated to build a short electric railroad, to connect the Saundertown ferry wharf with the Sea View Ry., which runs within half a mile of the wharf. The ferry belongs to the Jamestown Steam Ferry Co.

SAYREVILLE, N. J.—The Sayreville Electric Light & Power Co. has petitioned the Township Committee for a franchise for a trolley line from Sayreville to South Amboy. Sayre & Fisher, who conduct a brickyard at that place, are reported as back of the application. The proposed line, which is five miles, follows the route surveyed by the Brunswick Traction Co.

SPOKANE, WASH.—The City Park Transit Co., through Chester Glass, Secretary, has petitioned for a franchise for several proposed extensions.

STREATOR, ILL.—The City Council has granted a 35-year franchise to C. C. Barr, who bought the Streator Ry. Co.'s lines last October. Before buying this property, Mr. Barr was Receiver and General Manager. The present system will be extended.

SYRACUSE, N. Y.—Newspaper reports state that the Syracuse & Lakeside Ry. is about to secure control of the lake branch of the Delaware, Lackawanna & Western RR., which runs from Pleasant Beach to Long Branch. W. Judson Smith, John S. Kaufman and Herman Bartles are some of the parties who are reported interested in the Syracuse & Lakeside.

VANCOUVER, B. C.—The British Columbia Electric Ry. Co. has a petition before the City Council for extensions and improvements. J. Buntzen, for the company, asks a 50-year lease.

WALTHAM, MASS.—A franchise has been granted to the Lexington & Boston St. Ry. in Lexington, for its proposed line through that city. It is understood that the company intends to extend its lines from Arlington Heights to Billerica, and there connect with other lines. (Dec. 30, 1898, p. 939; Jan. 6, p. 17.)

WHITINSVILLE, MASS.—A company, with G. W. Whitin, Chester W. Lasell and C. A. Taft and others is reported organized, with a capital stock of $12,000, to build an electric railroad in the vicinity of Whitinsville.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—Judges Goff and Morris have signed an order granting permission to foreclose the mortgage on the Philadelphia Division. The mortgage was executed April 2, 1883, to cover payment of bonds aggregating £2,400,000 sterling. The last three semi-annual interest payments have been passed over. This foreclosure is in furtherance of the plans of reorganization. (Feb. 3, p. 95.)

CANADA EASTERN.—The Alexander Gibson Ry. & Manufacturing Co., which has bought this road, has given notice that application will be made to the Governor-General of Canada in Council Feb. 22, for the approval of the sale of the road to the Alexander Gibson Co. (Feb. 3, p. 95.)

An effort is being made, accoring to report, to induce the Canadian Government to buy the line. It extends from Loggieville, N. B., to Fredericton, 127 miles, with a branch from Blackwell to Indiantown, nine miles. It connects with the Intercolonial at Chatham and would form a part of that line.

DULUTH, MISSABE & NORTHERN.—Seventy-four first mortgage consolidated bonds, dated Jan. 1, 1893, have been drawn for payment at the Central Trust Co., New York, on and after Feb. 14, at 105 and interest. (Jan. 18, p. 35.)

INDIANA, ILLINOIS & IOWA.—Press reports state that an official of the Chicago, Burlington & Quincy has bought all the holdings of ex-Governor Drake, President of the I., I. & I., thus securing a controlling interest in that property.

JUNCTION CITY & FORT KEARNEY.—A decree of foreclosure was entered in the United States Circuit Court, District of Kansas, Feb. 6, on complaint of the American Loan & Trust Co. Thomas P. Wilson is appointed Special Master. The road is to be sold within 20 days. This line is controlled by the Union Pacific, but operated by the receivers. It went into the hands of receivers Oct. 13, 1893, with the parent company. It runs from Junction City, Kan., to Concordia, 70.86 miles, and from Lawrenceburg to Belleville, 17.15 miles, making a total of 88.01 miles.

LONG ISLAND.—A. C. Bedford on Feb. 8 made the following statement:

> Our company proposes to submit a plan to our security holders within a very few days for an issue of 4 per cent. bonds for the purpose of retiring the floating debt of the company. We have made some inquiries as to how such a proposition would be regarded by those interested, and have received the most hearty assurances. We have, too, received some flattering offers for new bonds. The plan, when carried out, will result in a considerable saving of interest charges to the road.

MINNEAPOLIS & ST. LOUIS.—The stockholders on Feb. 14 authorized the issue of $25,000,000 in new bonds, according to the proposition given in this column of Feb. 3 (p. 95.)

MISSOURI, KANSAS & TEXAS.—The suit of the Texas State Railroad Commission against this company to annul its charter on the ground that it was not complying with the State law, has been postponed a second time to April 10.

NEW ENGLAND.—The Massachusetts Railroad Commissioners announce that up to Jan. 1 there have been exchanged 197,630 shares of the N. E. common stock out of 200,000 shares outstanding, and 48,756 shares of preferred stock out of 50,000 outstanding. These shares are being exchanged for New York, New Haven & Hartford stock on the basis of five shares New England common, or two shares New England preferred, for one share N. Y., N. H. & H. common. (July 22, 1898, p. 540.)

NEW YORK & LONG BRANCH (Central of New Jersey).—Holders of first mortgage 5% bonds of the N. Y. & L. B., dated Jan. 16, 1882, are notified that the same will be redeemed at 110 and accrued interest on June 1, at the office of J. P. Morgan & Co., New York. After that date interest will cease.

NEW YORK, ONTARIO & WESTERN.—Messrs. Kuhn, Loeb & Co., New York, give notice that after Feb. 28, the cash allowance of the consolidated first mortgage 5 per cent. bonds, called for redemption on June 1, will be reduced one-half of one per cent. (Dec. 23, 1898, p. 925.)

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—The minority stockholders have filed a complaint against the Directors of this company in the United States Circuit Court in Philadelphia, in which they allege that the Directors have not complied with the articles of incorporation of the company, providing that the net earnings shall be paid each year in dividends. The plaintiffs ask for the appointment of a receiver for the surplus fund of the company, which is stated to be more than $3,000,000, and ask that it be distributed among the stockholders. It is further stated that more than $8,000,000 has been expended in improvements contrary to this article of incorporation, and the stockholders ask that a sufficient amount of bonds be sold to reimburse the treasury for the net earnings expended, and that the proceeds be distributed among the shareholders. An injunction is also asked to restrain the Directors from using the net earnings hereafter for improvements, but that they be applied to the payment of dividends.

RICHMOND, NICHOLASVILLE, IRVINE & BEATTYVILLE.—The United States Circuit Court of Appeals, on Feb. 7, confirmed the judgment of Judge Barr setting aside the sale of this road to Bennett H. Young and others on Oct. 6, for $160,000. (Dec. 2, 1898, p. 870.)

SEABOARD AIR LINE.—Bills have been introduced into the North Carolina General Assembly to amend the charter of the Raleigh & Gaston so as to authorize it to consolidate with the Seaboard & Roanoke and other companies of the S. A. L. The effect would be to absorb all the companies under the title of the Raleigh & Gaston.

SOUTHERN PACIFIC.—A bill has been introduced into the Texas Legislature authorizing the Texas & New Orleans to make its proposed consolidation with the Sabine & East Texas, the Louisiana Western extension and the Texas Trunk companies. (Dec. 23, 1898, p. 926.)

YANKTON, NORFOLK & SOUTHWESTERN.—This property was sold at public auction at Pierce, Neb., Feb. 7, to W. W. Graham, of Norfolk, O., for $45,000. The sale was ordered last April on complaint of W. W. Graham and others, at the upset price of $45,000. It was projected to extend from Norfolk, Neb., north about 60 miles to Yankton, S. D., and of this about 20 miles from Osmond to Wausa is said to have been completed in 1893. Mr. Graham is reported as intending to push the completion of the road. (April 29, 1898, p. 318.)

Electric Railroad News.

BALTIMORE, MD.—The Directory of the United Railways & Electric Co., of Baltimore, which is the title of the company under which the consolidated street railroads of Baltimore are to be operated, is composed of Alexander Brown, Henry A. Parr, Geo. R. Webb, Nelson Perrin, Geo. C. Jenkins, Wm. P. Harvey and E. L. Bartlett. (Feb. 13, p. 111.)

BEAVER FALLS, PA.—At the annual meeting of the Beaver Valley Traction Co., Feb. 6, the following Board of Directors were elected: Dr. T. P. Simpson, A. M. Jolly and J. P. Sone, of Falls; R. S. Kennedy and Dr. W. C. Simpson, of New Brighton; John M. Buchanan, of Beaver, and H. P. Brown, of Rochester. This organization of the Board of Directors is different than that of last year.

DENVER, COL.—The stockholders of the Denver City Consolidated Tramway Co. voted on Feb. 15 on the proposition to consolidate with the Denver City Traction Co., under the title of the Denver City Tramway Co., which is to be the title of the consolidated companies of Denver. The Denver City Traction Co. will shortly take possession of the Denver City Ry., and the West End St. Ry., and will immediately transfer them to the Denver City Tramway Co., according to the plan for the consolidation of these companies. (Dec. 23, p. 925; Jan. 13, p. 36.)

HARTFORD, CONN.—The Hartford & West Hartford Horse RR. Co. is now being operated by State Treasurer Mersick, in the interest of the first mortgage bondholders. He has appointed Jas. T. Patterson, of Bridgeport, as agent to operate the road. This company was chartered with a capital stock of $1,000,000, and is in default of a mortgage for $315,000. The road is 13½ miles long. David Hennery, was President.

HULL, QUE.—Messrs. Perkins & Fraser, solicitors of Ottawa, give notice that application will be made to the Parliament of Canada at its next session for an act giving effect to an agreement dated Jan. 9, 1899, whereby the Canadian Pacific Ry. Co. agrees to sell and convey to the Hull Electric Co. the 24-mile branch railroad between Aylmer, Que., and the main line of the Canadian Pacific Ry. at Hull, Que., for $100,000. The line has been operated by the Hull Electric Co. for some time under lease, and now they are purchasing it outright. Alexander Fraser is President.

INDIANAPOLIS, IND.—John B. Cockrum, who has been Administrator for the estate of the late R. T. McDonald, President of the Indianapolis & Broad Ripple Rapid Transit Co., informs us that he is Receiver for the road, and that no decision has yet been arrived at for the disposal of the property. The Broad Ripple does not figure in the proposed consolidation of street railroads in Indianapolis. (Feb. 11, p. 112.)

NEW BRUNSWICK, N. J.—Hereafter the office of the New York & Philadelphia Traction Co., formerly in Trenton, will be in New Brunswick. This was decided at the annual meeting at Trenton, Feb. 6, at which time the following Directors were elected: Gottfried Krueger, Edward H. Radel, J. Blair McAfee, Andrew Radel and Henry Schnellbacher. The officers elected are. Gottfried Krueger, President; J. Blair McAfee, Vice-President; Edward H. Radel, Secretary. The New York & Philadelphia Traction Co. is now practically one with the Brunswick Traction Co., the officers being about the same. The old officers of the N. Y. & P. T. have been retired. Mr. Krueger has had a controlling interest in the N. Y. & P. T. for some time. (Nov. 4, 1898, p. 806; Trenton, Feb. 3, p. 94.)

NEW CASTLE, PA.—James M. Martin and S. L. McCracken, as attorneys for Nicholas V. Leslie, have filed a bill in equity against the Mahoning Ry. Co., asking that a Receiver be appointed. This company was formed some time ago to build an electric railroad between Mahoning and New Castle, but it was never built. Mr. Leslie sued the company for payment for ties he had furnished, and secured a verdict for $1,100, which remains unpaid.

NIAGARA FALLS, N. Y.—The Niagara Falls & Lewiston RR., popularly known as the "Gorge route," has been sold to New York capitalists. John R. Megrue, of New York, formerly Manager of the Detroit & Lima Northern, is now President and will take control at once, and improvements, according to report, are expected.

ST. LOUIS, MO.—The People's Railway was bought at public auction Feb. 10 by Brown Bros. of New York; the price paid, according to report, was $500,000. The People's Ry. Co. is capitalized at $1,000,000. The sale was subject to the first and second mortgages, amounting to $200,000 and accrued interest. (Jan. 6, p. 18.)

TIFFIN, O.—At a meeting of the Directors of the Tiffin, Fostoria & Eastern Electric Ry. Co., Feb. 1, D. H. Kimberly, of Cleveland, was elected President, W. H. Gabriel, Vice-President; C. O. Evarts, Secretary, and S. B. Sneath, of Tiffin, Treasurer.

TRENTON, N. J.—The consolidation of the Trenton Passenger St. Ry. and the Electric Light Co. was to take place Feb. 1, under the title of the Trenton Electric Light, Gas & Power Co. The officers of the new company are: President, Henry C. Moore, former President of the Trenton Street Ry.; Vice-President, Wm. C. Barr, of Orange, and Secretary and Treasurer, A. R. Kuser, of Newark.

WASHINGTON, D. C.—A controlling interest in the Brightwood Ry. Co. has been purchased by Frederick C. Stevens. This company has a bonded indebtedness of about $400,000, and a capital stock of $100,000. The road has never paid a dividend, but has earned enough to pay operating expenses and fixed charges. Feb. 6 the late Board of Directors resigned and the following were chosen as the new board: Frederick C. Stevens, O. T. Crosby, H. D. Mirick, C. A. Leib, J. B. Davis, C. P. Williams and O. C. Brothers.

The syndicate in which Messrs. Stevens and Crosby are interested are gradually securing control of the various street railroads in Washington. Mr. Crosby is President of the City & Suburban, and owns a controlling interest in the Anacostia & Potomac River RR., the Belt Ry. and other roads.

TRAFFIC.

Traffic Notes.

At the request of the Memphis Freight Bureau the Southern Railway has decided to allow commercial travelers to ride on freight trains.

Mr. George L. Carman, of the Western Railway Weighing Association and Inspection Bureau, has established an agency of the association at Spokane. Mr. Carman tells a reporter that his bureau now employs 700 men.

The Newport News Abattoir Company, in which it is said the Chesapeake & Ohio Railroad is interested, has been incorporated, to establish a large plant at Newport News, Va., for doing a general beef business. The ships sailing between Newport News and European ports are to be fitted with cold storage rooms.

Chicago Traffic Matters.

Chicago, Feb. 15, 1899.

The time war among the Western roads has broken out afresh. The recent meeting of the general superintendents reached no agreement, and the Burlington will on next Sunday reduce by 3 h. 35 min., the time of its No. 1 between this city and Denver. The train will leave Chicago at 6 p. m., and will arrive in Denver at 7.15 p. m. the next night—1,020 miles in 26 h. 15 min., against 29 h. 50 min., as at present. The west-bound train now leaving Chicago at 10.30 p. m. will, by the new table, leave at 11.20 p. m., and arrive in Denver at 7.10 a. m. as before. This road will also reduce the time of its Chicago-Omaha train to 12 hours, leaving here at 8 p. m., and arriving at Omaha at same hour the next morning. The eastbound time from both Denver and Omaha will be reduced materially, but not so much as the westbound. The Burlington will put on a connecting train in each direction between Kansas City and Lincoln, Neb. The Milwaukee road is now the only Chicago-Missouri river line that has not reduced its time. The Rock Island is looked upon as the aggressor in the time trouble. When the Northwestern and the Burlington put on their fast mail trains the Rock Island, in meeting the mail schedule, added coaches and sleepers, giving little attention to the mail but booming the passenger feature of the train. Travelers in the West do not demand these extra fast trains, and there is absolutely no good business excuse for them.

It is alleged that a violation of the presidents' agreement has been discovered. For some time the Nickel Plate has been selling half-rate tickets on the order of the local Chief Clerk of the United States Express Company. Detectives in the employ of the Central Passenger Association found that these tickets, or orders for the same, as the case might be, were being turned over to the proprietor of a local theatrical hotel for the accommodation of his guests. The tickets were all to New York, and all read over the Nickel Plate road. The express company's clerk, Colvin by name, says General Agent Callahan of the Nickel Plate authorized him to draw on him for the tickets. The requests for tickets did not follow the rule of the express and railroad companies, which requires that they be signed by an officer of the requesting company. The affair has created a sensation among officers of the eastbound lines.

The question of abolishing second-class fares among the Central Traffic Association lines has been referred to a committee. The general passenger agent of each road in the association will make a careful canvass of his territory to ascertain to and from just what points he can, without serious friction, discontinue the sale of these tickets.

The minimum car load disturbance among the eastbound roads has resulted in the Big Four announcing that it will acept 24,000 lbs. as a car load on all traffic except provisions. This line with the other roads are adhering to 26,000 lbs. on the latter commodity. The original agreement, which was not kept, exacted 30,000 lbs.

Eastbound shipments of flour, grain and provisions from Chicago and Chicago junctions to and beyond the western termini of the Trunk Lines for the five weeks ending Feb. 11 amounted to 626,128 tons, as compared with 411,751 tons for the corresponding period of last year. This statement includes 120,599 tons of flour, 392,087 tons of grain and 69,467 tons of provisions. The following table shows the quantities and proportions carried by the respective roads:

	Tons.	Per cent.
Baltimore & Ohio	41,170	6.4
Cleveland, Cin., Chi. & St. Louis	25,505	4.6
Chicago & Erie	53,181	8.4
Grand Trunk	77,073	12.4
Lake Shore & Michigan Southern	90,010	14.1
Michigan Central	84,955	13.1
New York, Chicago & St. Louis	70,743	11.3
Pitts., Cin., Chi. & St. Louis	60,773	9.0
Pittsburgh, Ft. Wayne & Chicago	92,917	14.5
Wabash.	39,781	6.2
Totals.	626,128	100.0

Eastbound shipments from Chicago, as reported weekly by the Board of Trade were, for the five weeks ending Feb. 11, 574,732 tons, as compared with 403,732 tons for the corresponding period of last year. This total of 574,732 tons is made up of 114,163 tons of flour and mill stuffs, 310,295 tons of grain, 57,447 tons of provisions, 45,303 tons of dressed beef, and 47,355 tons of miscellaneous freight.

The statements of freight shipped eastward from Chicago are made up on two bases. The first statement given above is that furnished by the Chicago Freight Committee. It covers only three principal classes of freight, and it includes only such shipments as are carried through to Buffalo, Pittsburgh, Wheeling, etc.; but it includes shipments from all junction points in Cook County, and from some other points, including all from the Elgin, Joliet & Eastern. The second statement does not include shipments from the junctions outside the city, but it does include, practically, all kinds of freight except live stock, and it shows the total shipments by the roads mentioned to all points, both through and local.